

# The Iron Age

A Review of the Hardware, Iron and Metal Trades.

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## The Bower-Barff Process.

BY A. S. BOWER, C. E.\*

Any process which has for its object the preservation of iron and steel from rust, and which will make these metals more applicable than they now are to the requirements of mankind, will be sure to meet with attention from members of this Association, and from all those who are either engaged in the extraction of the ore, its reduction to metal, or the subsequent application of the metal itself.

It is, perhaps, not too much to say that with iron and steel rendered secure against corrosion and decay, they will be used to an indefinitely greater extent than they now are. The whole realm of science has, therefore, been explored in the attempt to discover some method by which the formed article may be preserved, leaving its strength undiminished by the destructive action of rust. Paints, oils, varnishes, glazes, enamels, galvanizing, electro-depositing, and what is called "in-oxidizing" are among the many systems now in vogue to effect the preservation of iron and steel from the corrosive action of air and water. The object of this paper is to show what may be done in protecting iron and steel from rust by forming upon their surface a film of magnetic oxide by an inexpensive process.

It is no new thing to be told that magnetic oxide of iron is unaffected by exposure to the atmosphere or to salt water for any length of time. The black sand of Taranaki, in New Zealand, is a sufficiently good example of this. Doctor Percy has pointed out that the reason why Russian sheet iron is less affected by exposure than ordinary sheet iron is because of a coating of magnetic oxide; but this was not known until Doctor Percy discovered it. That such a coating is produced is quite certain, but it is only an accident of manufacture. To Professor Barff is due the credit of being the first to deliberately undertake to coat iron and steel with magnetic oxide, produced designedly for the purpose of protecting their surfaces from rust.

Some 16 or 17 years ago my father was making a series of experiments in the production of heating gases, one set of them being the decomposition of water by passing superheated steam through masses of red-hot iron. He noticed that the iron became less and less active until it ceased to decompose at all, when, on examining it, he saw that it was coated with a kind of enamel. It at once occurred to him, on seeing this, that the process in question might be used to obtain such a coating, but he found, after a few days' exposure of the iron to the atmosphere, that the coating shelled off, and he pursued the matter no further. The iron employed in this case was rusty, but if it had been new my father would in all human probability have been the accidental author of the process which Professor Barff discovered ten years afterward. I only mention this to show how advisable it is to investigate the causes of unexpected effects. Professor Barff's process consists in subjecting iron or steel articles to the action of superheated steam, and when they are at a temperature sufficiently high, three equivalents of iron combine with four of oxygen, forming one equivalent of magnetic oxide, and setting eight of hydrogen free, or symbolically (1)  $\text{Fe}_3 + 4(\text{H}_2\text{O}) = \text{Fe}_2\text{O}_4 + 8\text{H}$ .

Upon reading a description of the Barff process in the London Times, it occurred to my father that what the Professor could effect with steam he might also effect with

air, and several experiments were made to this end, which, however, were very varied in character, as also were they in the results obtained. The first was made with cast iron by placing the articles to be treated in a cast-iron retort, heated externally, and then passing superheated air over them, and it was successful, while nearly all others afterward were quite the reverse, as sesquioxide

combination only, I came to the conclusion that, to form the lower or magnetic oxide, the quantity of free oxygen, and so of the air employed, must bear some proportion to the surface of the articles exposed to its action, more especially when a comparatively low heat is employed. This is so, and it has been proved that the quantity of air passed through the retort during most of the unsuccess-

oxide in close proximity with the iron, due to the reducing influence of the metal in contact with the sesquioxide at an elevated temperature. The general appearance, however, of iron so treated was disagreeable, to say the least of it. The mode of action I then adopted was to admit a few cubic feet of air into the retort at the commencement of every half-hour, and then to leave the

by first dipping them all into a tank of water of known area, lifting them out, and noticing the amount of water taken out of the tank by the wetted surface, and regulating accordingly a slow, continuous air supply by meter, of course keeping the temperature of the muffle as nearly constant as possible. This, too, was successful; but the same objections applied to that mode of procedure as to the other.

There was commenced a series of experiments with carbonic acid chemically produced by the decomposition of chalk, the idea being that three equivalents of iron would unite with four of carbonic acid, forming one equivalent of magnetic oxide and four of carbonic oxide, if the heat were sufficiently high. This reaction is expressed symbolically thus: (2)  $\text{Fe} + 4(\text{CO}) = \text{Fe}_2\text{O}_4 + 4(\text{CO})$ . This is the simplest action that could take place, but it was evident from the results that something quite different was obtained, inasmuch as the coating was very light in color, pleasing to the eye, but easily removed, and in that sense entirely differing from the articles you see before you. This coating, from effects exactly similar and designately produced by a studied manipulation in the furnaces in successful operation in England, France and here, proves pretty conclusively that carbonic acid, practically pure, produces upon iron, at an elevated temperature, a film which is, in composition, a mixture of  $\text{Fe}_2\text{O}_4$  and  $\text{Fe}_3\text{O}_4$ , or, at all events, it is nearer the metallic state than is magnetic oxide. But even supposing that the results obtained by the carbonic acid had been successful as then carried out, the objections referred to concerning the air process would still exist, as external heat and a closed iron muffle would always be necessary. I therefore proposed to use a fuel-gas producer, similar in principle to the Siemens generator, but altered practically to suit other requirements, to burn the combustible gases thus produced with a slight excess of air over and above that actually required for perfect combustion, and to heat and oxidize the iron articles, placed in a suitable brick chamber, by these products of combustion. I also arranged a continuous regenerator of fire-clay tubes underneath the furnace, so that the products of combustion leaving the oxidizing chamber passed outside the tubes, imparting a portion of the waste heat to them, which was taken up by the ingoing cold air passing through their interior on its way to the combustion chamber. I had hoped in this way to be able to regulate the excess of air over that required for complete combustion as to be able to produce magnetic oxide directly, instead of the lower and useless oxide or combination of oxides produced by carbonic acid alone. I obtained some beautiful results, and some again were unaccountably bad, and I soon found that it was as difficult to regulate the precise amount of oxidation as it first was in the Bessemer process, and I was fortunate enough to hit upon an almost parallel remedy—that is to say, I increased the quantity of free oxygen mixed with the products of combustion, and oxidized the iron articles to excess during a fixed period of generally 40 minutes, when magnetic oxide was formed close to the iron and sesquioxide over all. Then for 20 minutes I closed the air inlet entirely, leaving the gas-valve open, and so reduced the outside coating of sesquioxide to magnetic oxide by the reducing action of the combustible gases alone.

The excess of oxygen in the first instance produces  $\text{Fe}_2\text{O}_3$ , or sesquioxide of iron, and the under surface of this, being in contact with metallic iron, undergoes reduction to magnetic oxide in the following manner:

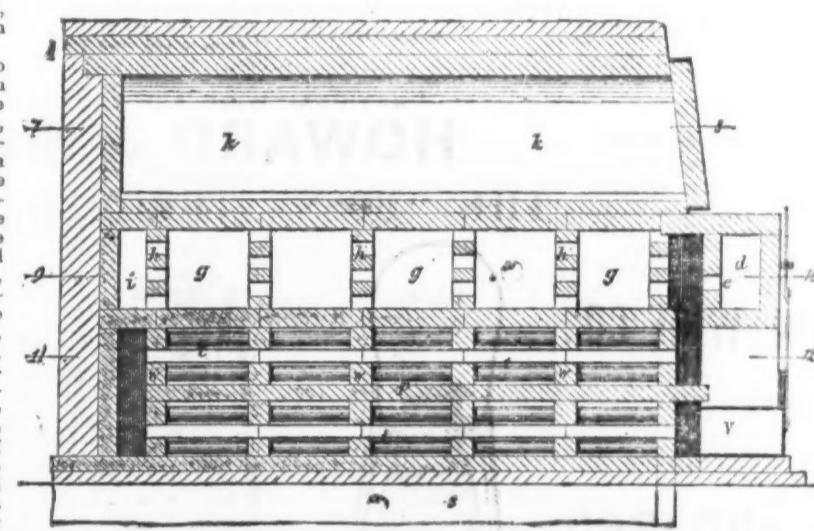


Fig. 1.—Longitudinal Section of Bower Furnace Along Line 1—2 in Fig. 3.

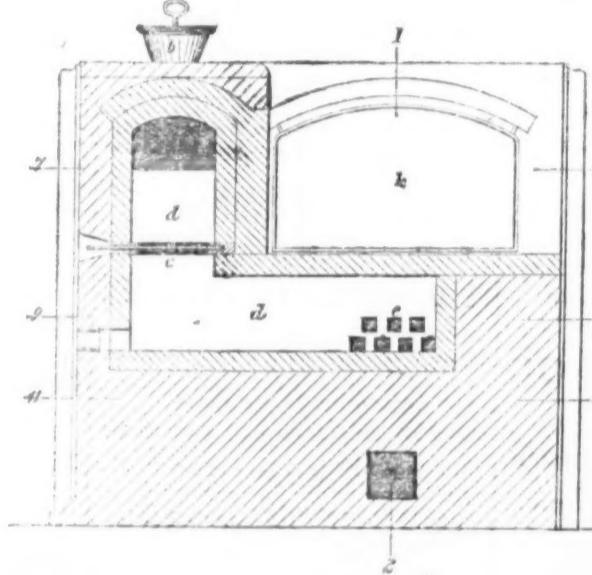


Fig. 2.—Transverse Vertical Section Along Line 3—4 in Fig. 3.

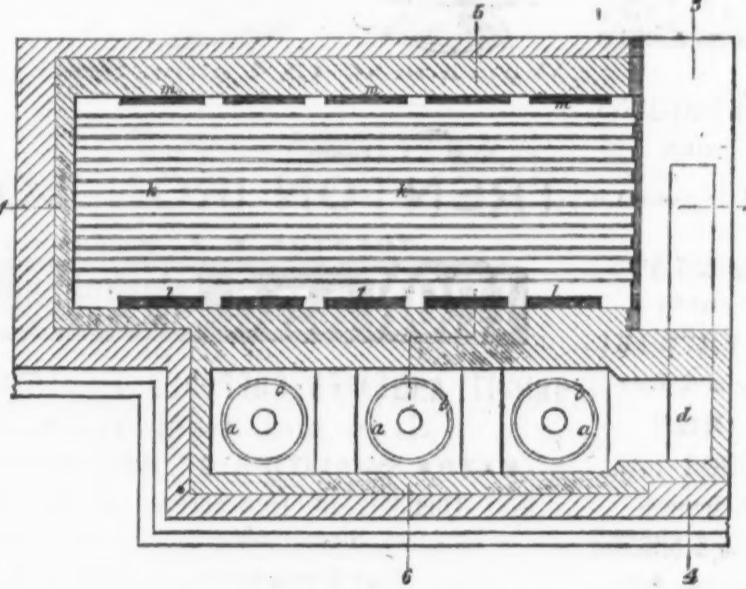


Fig. 3.—Horizontal Section Along Line 7—8 in Figs. 1, 2 and 5.

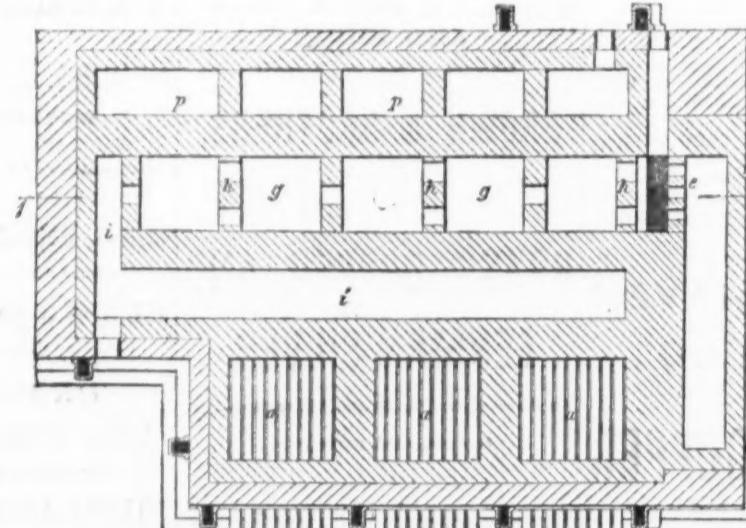


Fig. 4.—Horizontal Section Along Line 9—10 in Figs. 1, 2 and 5.

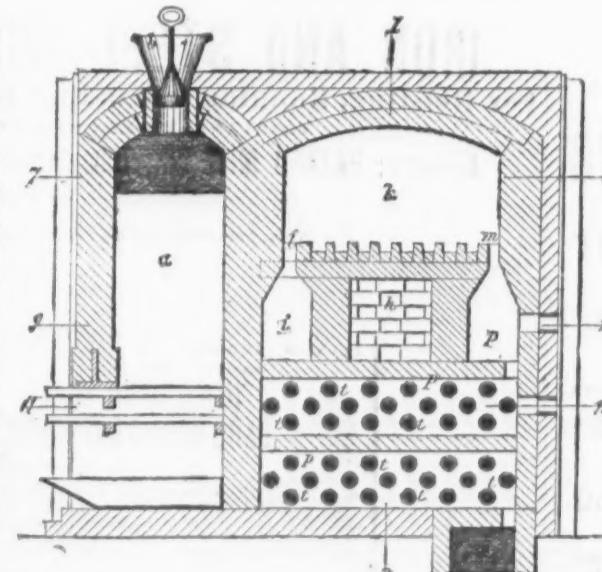


Fig. 5.—Transverse Vertical Section Along Line 5—6 in Fig. 3.

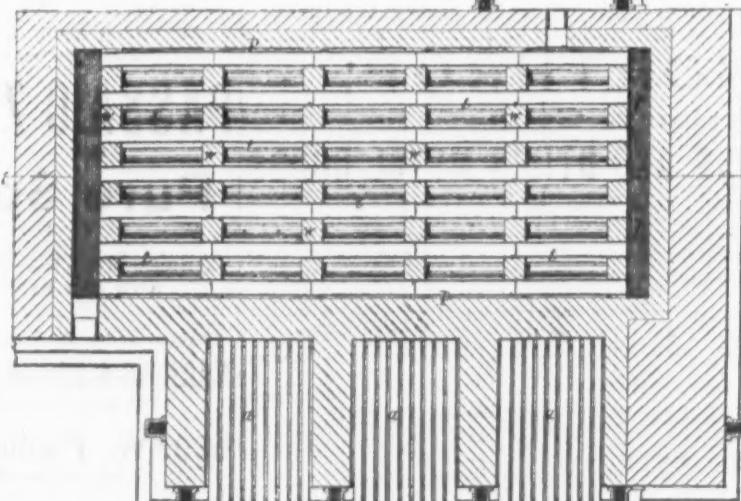


Fig. 6.—Horizontal Section Along Line 11—12 in Figs. 1, 2 and 5.

## THE BOWER-BARFF PROCESS FOR THE PRESERVATION OF IRON AND STEEL.

was copiously produced as well as the magnetic. Another experiment was made by placing a bar of polished cast iron in the main duct of superheated air to a blast furnace, and this, though covered with a red sesquioxide powder and easily brushed off, had a thin, but very firm and tenacious, coating of magnetic oxide in contact with the iron. This bar has been exposed to the weather ever since, or over four years, without the slightest appearance of rust. Ultimately, when thinking over the fact that air is oxygen and nitrogen in mechanical

cessful experiments was 300 or 400 times more than was actually necessary. The reasons also why the first experiment was successful were that a great number of articles were in the muffle, that a very high heat was employed, and that the retort had been previously used for coal-gas making, and had a deposit of carbon in it, which to a great extent neutralized the effect of the large excess of air.

All the unsuccessfully treated articles were red with sesquioxide outside; but there was, nevertheless, a coating of magnetic

iron and air to their own devices, the retort, of course, being tightly closed. During each half hour a coating of magnetic oxide was formed, and the operation was repeated as often as was considered necessary. Effectively as this was for cast iron, the cost of producing the coating was as great as by the Barff process, for both of them required that the chamber should be heated externally, and this, with large furnaces, is very expensive. Another plan that I adopted was to first find out approximately the extent of the surface of the goods to be treated,

\* Read at the annual meeting of the American Institute of Mining Engineers, February 21st, 1883.

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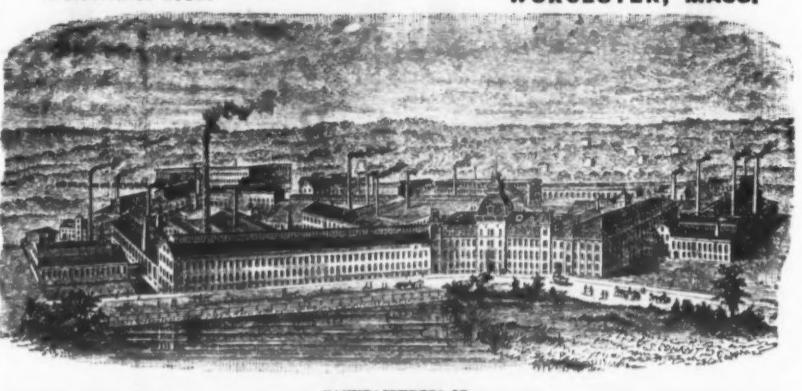
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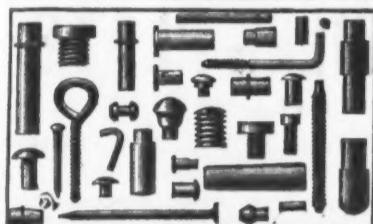
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When deoxidizing by combustible gases, consisting mainly of carbonic oxide, three equivalents of sesquioxide unite with one of carbonic oxide and form two equivalents of magnetic oxide and one of carbonic acid, and, symbolically, (4)  $3(\text{Fe}_2\text{O}_3) + \text{CO} = 2(\text{Fe}_3\text{O}_4 + \text{CO}_2)$ . Another method of reduction is by carbon itself, when the formula stands thus: (5)  $3(\text{Fe}_2\text{O}_3) + \text{C} = 2(\text{Fe}_3\text{O}_4 + \text{CO})$ .

Formula (4) is also the reaction when rusty iron is reduced by producer gases, and which consist largely of carbonic oxide, and by the specimens exhibited it will be seen that articles completely pitted with rust may have their surfaces rendered rustless. In this case the periods of oxidizing and deoxidizing are reversed—that is to say, the latter occupies 40 and the former 20 minutes. No oxidizing is theoretically necessary, but practically a certain amount is requisite to keep up the heat in the chamber, which, of course, could not be done unless combustion took place some time or other. I only mention the reduction by carbon as exemplified by Formula No. 5 because, while experimenting with a furnace, I was asked by the proprietors of a valuable red-oxide deposit, which was found in so finely divided a state as to be capable of being used at once as a paint, whether I could reduce it to a magnetic oxide. I tried to do so by carbonic oxide, but I found that only the surface of it was affected, and that even this, when taken out of the furnace, speedily returned to its original red color by the combined actions of the hot unconverted material underneath and the air above. It will be found from formula (5) that  $2\frac{1}{2}$  pounds of carbon are required to reduce 100 pounds of red oxide. This I mixed intimately, in the shape of powder, with the red oxide, brought the mixture to a red heat and the result was black magnetic oxide. Not only this, but by adding more carbon I could make the color lighter and lighter until it was almost identical with the coating produced in my previous experiments with carbonic acid, and by reducing the quantity of carbon below  $2\frac{1}{2}$  per cent various shades of purple were obtained, the red appearing more and more prominent as the quantity of carbon was diminished. It will be as well, before I make any comparison between Professor Barff's process and those patented by my father and myself, to state that the whole of the Professor's patents, wherever existing, have been purchased by my father, so that in this case at least I hope you will not say that "comparisons are odious." Professor Barff's process is better than ours for wrought iron, and perhaps for polished work of all kinds, as iron commences to decompose steam at a very low temperature; in fact, much below visible redness. Only the other day, at the annual meeting of the Association of American Stove Manufacturers, held in New York, I was asked whether stove patterns might not be made of cast iron, polished and then oxidized? Here is one among many instances where the steam process is almost invaluable. For ordinary cast iron, and especially that quality which contains much carbon, the Barff process is much too slow in its action, and some specimens that I have treated in England have taken as much as 36 hours to coat effectually, which could readily have been finished off in five hours by the Barff process.

The main distinction between the two is that the Barff is much more energetic in its action than the Barff process. The carbon in cast iron impedes oxidation, and so, while cast is far more readily treated in the Barff furnace, wrought iron is apt to scale unless it is rusted beforehand. The rust then eats into the metallic surface under the influence of heat, and forms a tenacious combination with it. The objection to the use of a closed muffle externally heated in the Barff process has been almost entirely overcome by simply putting wrought iron into a Barff furnace, previously well heated, then shutting off both the gas and air supplies, and admitting steam into the regenerator tubes. The steam thus passes through the red-hot tubes, then through the combination chamber and its contingent passages, already highly heated, over the articles in the oxidizing chamber, heating and oxidizing them, and thence over the outside of the regenerator tubes, depositing a great portion of its heat there before passing to the chimney, and which is again picked up by the incoming fresh, cool steam. In this way the heat in the chamber is highest shortly after the commencement of the operation, and gets gradually lower during the time of exposure, which varies, according to the class of goods, from five to ten hours. At the close of the operation, just before the articles are taken out, everything is moderately cool, and this for steam is the perfection of action, as stated by Professor Barff himself. Steel, I consider, can be equally well treated by both processes, and, indeed, it is natural to expect this, steel being, so far as the quantity of carbon it contains is concerned, between cast and wrought iron. Polished steel, however, is better treated in a low-temperature Barff furnace.

With regard to the quality of fuel burned in the gas producers, a non-cooking gas coal is the best, and Virginian sphinx has suited very well in this country, and of this about 1 ton every three days is required for a furnace with an oxidizing chamber 13 feet long, 4 feet 3 inches wide and 4 feet 3 inches high. When a gas coal is employed, it should be fed through the charging hopper just before each deoxidizing operation, when a smoky flame is of great advantage. I have, however, discovered that anthracite can be used as well as a gas coal, by simply allowing petroleum to drop at the rate of 1 gallon per hour upon the red-hot surface of the coal in one of the gas producers. This method has been exclusively used in the coating of the articles exhibited in this room at the works of Messrs. Pouson & Eger, architectural engineers, at North Eleventh and Third streets, Brooklyn, E. D., N. Y., to whom I am much indebted, not only for these beautiful castings, but for the constant courtesy and energy they have always exhibited during the erection of their furnaces. At pres-

ent they have two erected, one a Bower furnace of the size before mentioned, and the other a small Barff furnace for the treatment of very delicate or polished articles.

These magnetic-oxide processes not only protect from rust, but the coating is of such a beautiful color as to render articles ready for the market as soon as they are out of the furnace and cooled. One remarkable feature of them is that there is no more cost (except in the labor of handling them) in treating 2240 articles, each weighing a pound, than there is in coating a cube of metal weighing a ton; and so penetrating is the process that, no matter how intricate the pattern may be, every crevice—which it would be almost impossible to get at with a paint brush—is as effectively coated as the plainest surfaces, as will be observed by examining the specimens exhibited in this room. For art purposes the French gray color, with shades approaching to black, might not always be suitable; but if it should be necessary to use paint on the iron so coated, there is the absolute certainty that it will remain on in the same way as it does on wood or stone, and thus iron may be used for constructive work in a thousand directions in which it has not up to the present time been possible, on account of its liability to rust, no matter what the coating used to protect it has been.

I can give an instructive instance of this. A company in Paris had expended a very large sum over Dode's inoxidizing process, which process consists in the depositing of a layer of borate of lead on iron or steel, and then gilding, plating or bronzing them, and certainly the articles so treated were exceeding beautiful to look at; but the iron ultimately rebelled and threw off the coating, so that the shareholders were in a fair way of losing all their capital, when it was suggested to the directors that if their compositions could be deposited direct upon magnetic oxide they would conquer the difficulty. They then applied to my father for specimens of coated iron to experiment upon, and they were so satisfied with the result that the company purchased all our European patents except England, and are carrying on the combined processes on a large scale. They have, besides their furnaces for the Dode process, four large Bower ones, two being 36 feet long by about 6 feet 6 inches wide and 6 feet high, and a Bower-Barff furnace, also of large size. Others, however, are in course of erection.

Engineers and manufacturers appear far more ready to apply the processes here and on the Continent of Europe than up to the present time they have been in England; but perhaps the reason has been that, so far as Professor Barff's process is concerned, it has only just been shown how large masses can be dealt with—namely, by the use of the Bower furnace—and I can show that for the treatment of underground pipes, wrought-iron sleepers, roofing and the like, the process can be readily applied, and at a cost much less than that of galvanizing, and it will at the same time be infinitely more durable; while for ornamental cast and wrought iron it is scarcely possible to imagine anything more artistic in color than some of the articles after they have been treated. For ordinary hollow-ware for kitchen use, whether of cast or wrought iron, this process is admirably adapted, and though I have been told that the gray or black color will probably be objectionable, yet I imagine, if it can be shown, as we can do, that the magnetic oxide is more durable, more easily cleaned and much cheaper than even the common tinted article, a market will soon be created. Anyhow, the new combined processes are so far developed and they have been so thoroughly examined by scientific and practical men both here and in Europe (whose testimony to the value and efficacy of them is voluminous), that they have passed from the region of theoretical investigation into that of practical application, and means have been taken for establishing works in different centers in Europe, as will also be done here, for the purpose of coating iron and steel as a trade operation. One firm alone in Scotland, Messrs. Walter Macfarlane & Co., have adopted the process, their output of ornamental castings per day exceeding 100 tons! It is intended to apply the process to cast-iron gas and water pipes, and as the former have comparatively no pressure to bear, they may be made much lighter than they now are, if rendered incandescent; while for water, it will be a great advantage to have both the main and service pipes rendered safe from rust, which only discolors the water, but forms the nucleus of very troublesome deposits. There is no reason now why wrought-iron or mild-steel pipes should not be used for the same purposes, especially for the interior towns of distant countries, where the first cost of the pipes is but small as compared with the cost of the Barff process.

My father has himself used gas and water pipes where the cost on arrival at their destination has been five times greater than their first cost in England. If, then, light wrought-iron or steel pipes could be used, not weighing one-third of those made of cast iron, and rendered practically indestructible, what an enormous saving will be effected! Again, in the case of railway sleepers in iron and steel, which are now almost wholly used in Germany, the process is likely to prove of much advantage, so at least I am told by engineers, both in Belgium and in Germany; and if there why not here? For fountains, railings and all architectural work the process is invaluable, and iron may now be used in many instances instead of bronze. It will naturally be asked, what is the cost of the process? I cannot do better than answer the question by quoting from the report of Professor Flamache, the engineer-in-chief of the State railways in Belgium, who was sent over specially to England to report on the process by the Public Works Department of that country. His estimate of cost, after a very careful examination and testing of the process, was 7½ francs per 1000 kg., or nearly \$2 per ton, at, of course, the Belgian rate of expenses. He also gives the cost of coating a certain extent of surface, but this I consider to be completely valueless, as, for example, I have had a furnace full of 56-pound weights and another time I have had it full of gas-governor tops, the surface in the latter case being perhaps one hundred times more in

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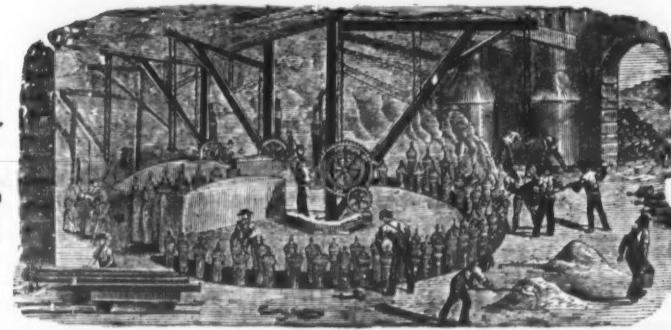
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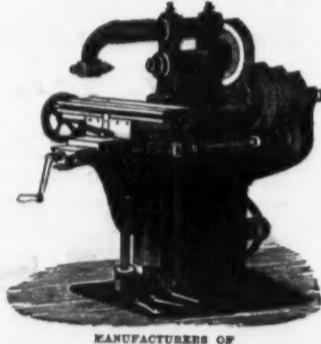
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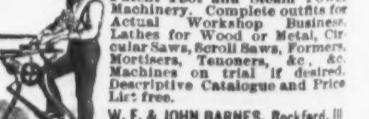
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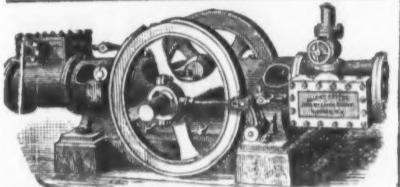
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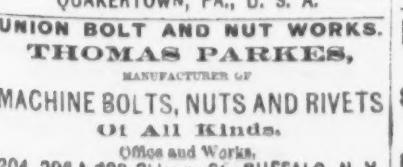
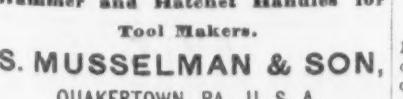
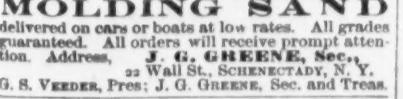
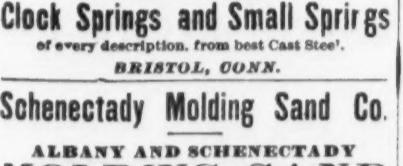


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resentations of Kraim justified the attachment, and its dissolution and allowance of damages for its issuance were erroneous."

#### COLLATERAL SECURITIES—DEBT NOT PAID.

A bank lent \$13,000, and the stock of a corporation was deposited with it as collateral security for the loan. On the failure to pay the debt the notes for it were sur-

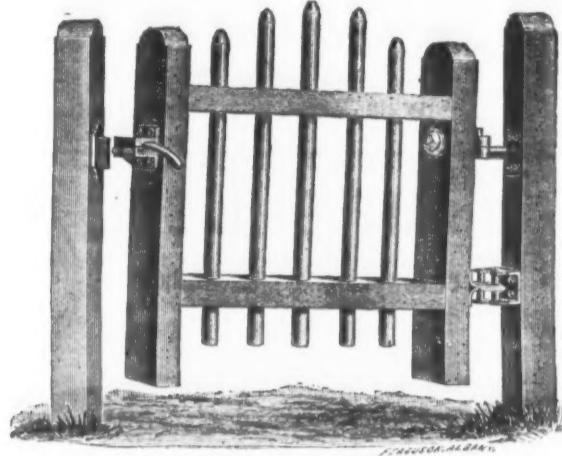


Fig. 1.—Improved Gate Trimmings, Manufactured by John L. Reed, Canajoharie, N. Y.

swings in either direction. Fig. 1 shows a rendered, and proper notice was given to the debtor that the security would be sold. At the sale, which was a public one, the creditor bought the stock and took a new certificate for it. The debtor then brought a suit in equity against the corporation and the creditor to have the shares declared to be his property, on the ground that the sale of the stock to his creditor did carry title to the creditor. In this case—Canfield vs. the Minneapolis Agricultural and Mechanical Association—the United States Circuit Court,

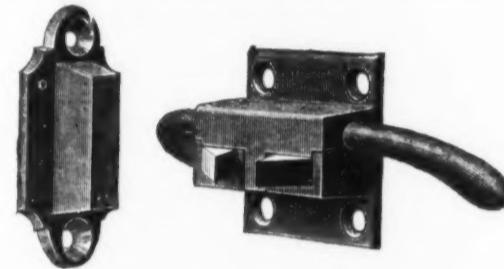


Fig. 2.—View of Latch and Stop.

from him. The arrangement of the hinges is such that the gate swings back and is held by the two latches shown in Fig. 2 engaging with the catch provided for the purpose. Fig. 3 shows the upper hinge, which, as will be seen, by means of the screw-plate that fastens to the post is adjustable in such a manner as to give the gate any rise on opening that may be desired. Fig. 4 shows the construction of the lower hinge which is used with a latch of this kind. The special

District of Minnesota, decided in favor of the debtor. Judge Nelson, in the opinion, said: "Though the apparent ownership of the notes was in a third person, and the sale of the stock conducted in his name, the evidence shows clearly that the bank was the real owner and purchaser, and it could not acquire any title to the stock by the purchase. The holder of collateral security is the trustee of the owner, and at the sale of it he is disqualified to become its purchaser; the



Fig. 3.—The Upper Hinge.

advantages pertaining to these fixtures, as set forth by the manufacturer, are that no springs are employed; that all the parts are of cast iron and are of a character not liable to get out of order, and that the parts are of such a shape that a gate may be opened when the person desiring to pass is unable to use his hands, as in carrying something. The weighted lever can be moved very readily by touching it with the elbow. The construction is such that the gate may settle

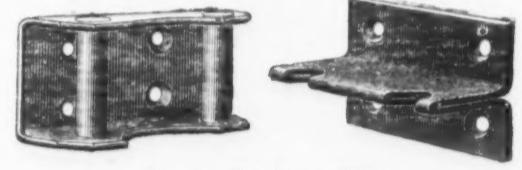
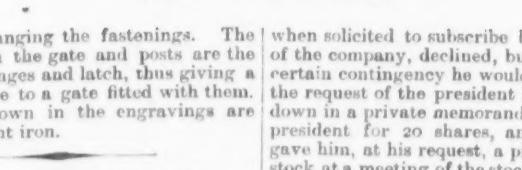


Fig. 4.—The Lower Hinge.

right to buy is in direct conflict with his duty to so conduct the sale that the best price shall be realized for the pledge."

#### SUBSCRIPTION TO STOCK—CONDITION.

A suit was brought to recover from a subscriber to the stock of a corporation the assessments thereon. On the trial of the action—McClelland vs. Whiteley—in the United States Circuit Court, Eastern District of Wisconsin, it appeared that the defendant,



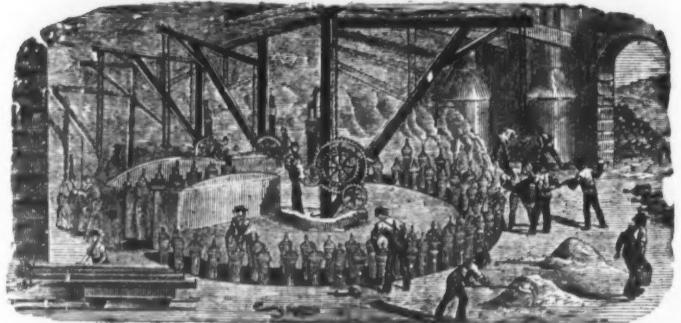
when solicited to subscribe by the president of the company, declined, but said that in a certain contingency he would subscribe. At the request of the president he put his name down in a private memorandum-book of the president for 20 shares, and subsequently gave him, at his request, a proxy to vote the stock at a meeting of the stockholders, which was used. The defendant showed that the contingency never happened, and claimed that the proxy and its use did not operate as a ratification of his subscription. Judge Dyer, in giving judgment for the defendant, said: "The proxy, it appears, was sent only in anticipation of a future subscription; that is, that the stock was to be taken on a certain event happening, and which did not happen. The defendant did not know that the president had placed his name on the subscription book of the company, and therefore was not bound by his action. As to the ratification, it is well settled that the ratification of the act of an agent previously unauthorized must, to bind the principal, be made with a full knowledge of all the material facts."

#### LIABILITY OF STOCKHOLDERS.

A creditor of a corporation, having obtained a judgment against it which was worthless, brought a suit in equity against certain stockholders to compel them to pay the unpaid assessments on their shares, in

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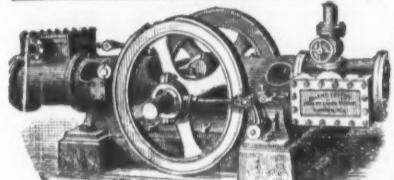
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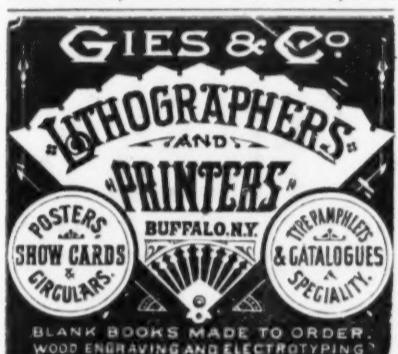


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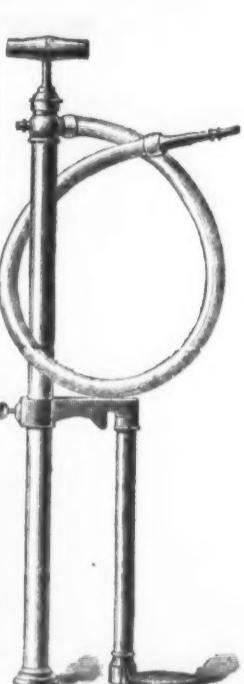
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Mr. John L. Reed, of Canajoharie, N. Y., has recently perfected an improvement in gate latches and hinges, the general features of which are clearly shown in Figs. 1 to 4 of the engravings. The gate latch is of the variety known as a gravity latch, and is so arranged as to be applied to a gate that

resentations of Kraim justified the attachment, and its dissolution and allowance of damages for its issuance were erroneous."

#### COLLATERAL SECURITIES—DEBT NOT PAID.

A bank lent \$13,000, and the stock of a corporation was deposited with it as collateral security for the loan. On the failure to pay the debt the notes for it were sur-

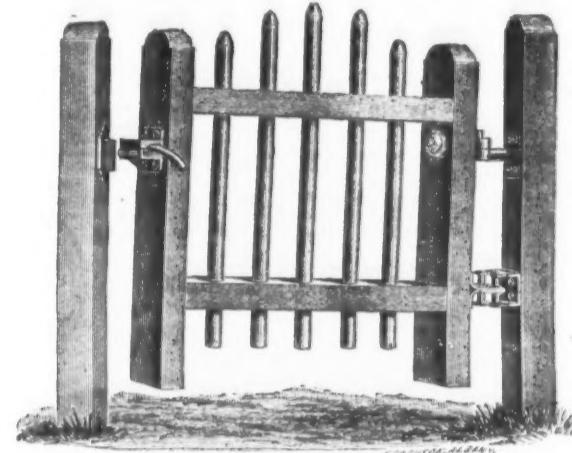


Fig. 1.—Improved Gate Trimmings, Manufactured by John L. Reed, Canajoharie, N. Y.

swings in either direction. Fig. 1 shows a gate with the trimmings we are describing fully applied, while Fig. 2 shows the latch itself. There are two independently operating catches, each provided with a crooked weighted lever that serves the double purpose of releasing the latch when the gate is to be opened, and by its weight of throwing it forward to hold the gate shut. In using a gate provided with this attachment, the weighted lever facing the person who desires to pass through is raised and the gate pushed

rendered, and proper notice was given to the debtor that the security would be sold. At the sale, which was a public one, the creditor bought the stock and took a new certificate for it. The debtor then brought a suit in equity against the corporation and the creditor to have the shares declared to be his property, on the ground that the sale of the stock to his creditor did carry title to the creditor. In this case—Canfield vs. the Minneapolis Agricultural and Mechanical Association—the United States Circuit Court,

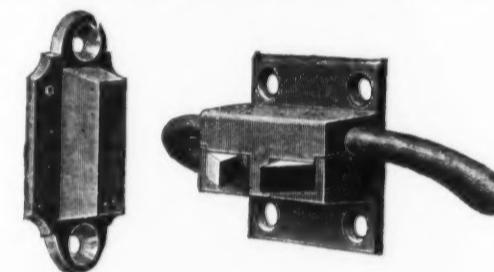


Fig. 2.—View of Latch and Stop.

from him. The arrangement of the hinges is such that the gate swings back and is held by the two latches shown in Fig. 2 engaging with the catch provided for the purpose. Fig. 3 shows the upper hinge, which, as will be seen, by means of the screw-plate that fastens to the post is adjustable in such a manner as to give the gate any rise on opening that may be desired. Fig. 4 shows the construction of the lower hinge which is used with a latch of this kind. The special

District of Minnesota, decided in favor of the debtor. Judge Nelson, in the opinion, said: "Though the apparent ownership of the notes was in a third person, and the sale of the stock conducted in his name, the evidence shows clearly that the bank was the real owner and purchaser, and it could not acquire any title to the stock by the purchase. The holder of collateral security is the trustee of the owner, and at the sale of it he is disqualified to become its purchaser; the



Fig. 3.—The Upper Hinge.

advantages pertaining to these fixtures, as set forth by the manufacturer, are that no springs are employed; that all the parts are of cast iron and are of a character not liable to get out of order, and that the parts are of such a shape that a gate may be opened when the person desiring to pass is unable to use his hands, as in carrying something. The weighted lever can be moved very readily by touching it with the elbow. The construction is such that the gate may settle

right to buy is in direct conflict with his duty to so conduct the sale that the best price shall be realized for the pledge."

#### SUBSCRIPTION TO STOCK—CONDITION.

A suit was brought to recover from a subscriber to the stock of a corporation the assessments thereon. On the trial of the action—McClelland vs. Whitley—in the United States Circuit Court, Eastern District of Wisconsin, it appeared that the defendant,

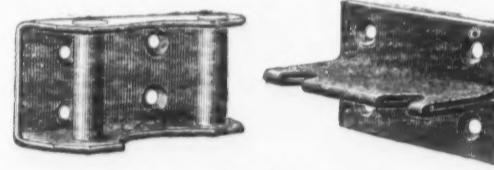


Fig. 4.—The Lower Hinge.

without disarranging the fastenings. The spaces between the gate and posts are the same for the hinges and latch, thus giving a good appearance to a gate fitted with them. The hinges shown in the engravings are made of wrought iron.

#### LATEST LEGAL DECISIONS.

##### ATTACHMENT—DEBTOR THREATENING TO DISPOSE OF HIS PROPERTY.

An attachment was procured against a debtor on the ground that he had made threats that he would dispose of his property to protect himself if he was sued by the plaintiffs; he said he had things fixed—all cut and dried. The lower court dissolved the attachment on the hearing, and an appeal was taken in the case—Newman vs. Kraim—to the Supreme Court of Louisiana, which reversed the judgment. Judge Penner, in the opinion, said: "It is said that the intention declared by Kraim was only a conditional one—dependent on suit being brought by plaintiffs. True, but this condition being dependent on the will of plaintiff, in the exercise of an unquestioned right, that condition being accomplished by the determination to sue, the declared intention to dispose of the property fraudulently became thereby actual and positive. The rep-

when solicited to subscribe by the president of the company, declined, but said that in a certain contingency he would subscribe. At the request of the president he put his name down in a private memorandum-book of the president for 20 shares, and subsequently gave him, at his request, a proxy to vote the stock at a meeting of the stockholders, which was used. The defendant showed that the contingency never happened, and claimed that the proxy and its use did not operate as a ratification of his subscription. Judge Dyer, in giving judgment for the defendant, said: "The proxy, it appears, was sent only in anticipation of a future subscription—that is, that the stock was to be taken on a certain event happening, and which did not happen. The defendant did not know that the president had placed his name on the subscription book of the company, and therefore was not bound by his action. As to the ratification, it is well settled that the ratification of the act of an agent previously unauthorized must, to bind the principal, be made with a full knowledge of all the material facts."

#### LIABILITY OF STOCKHOLDERS.

A creditor of a corporation, having obtained a judgment against it which was worthless, brought a suit in equity against certain stockholders to compel them to pay the unpaid assessments on their shares, in

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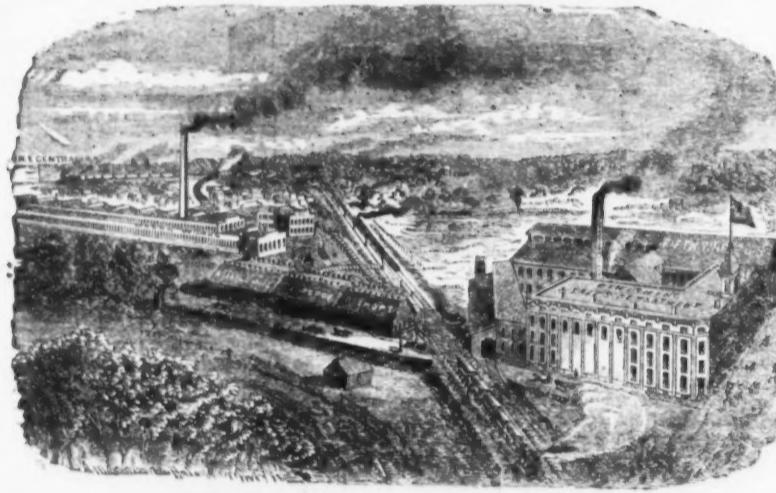
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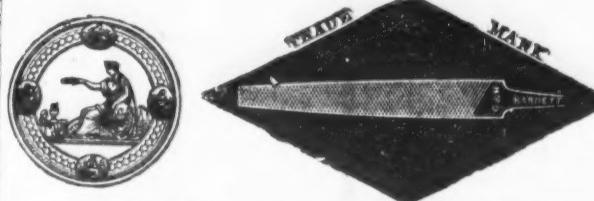
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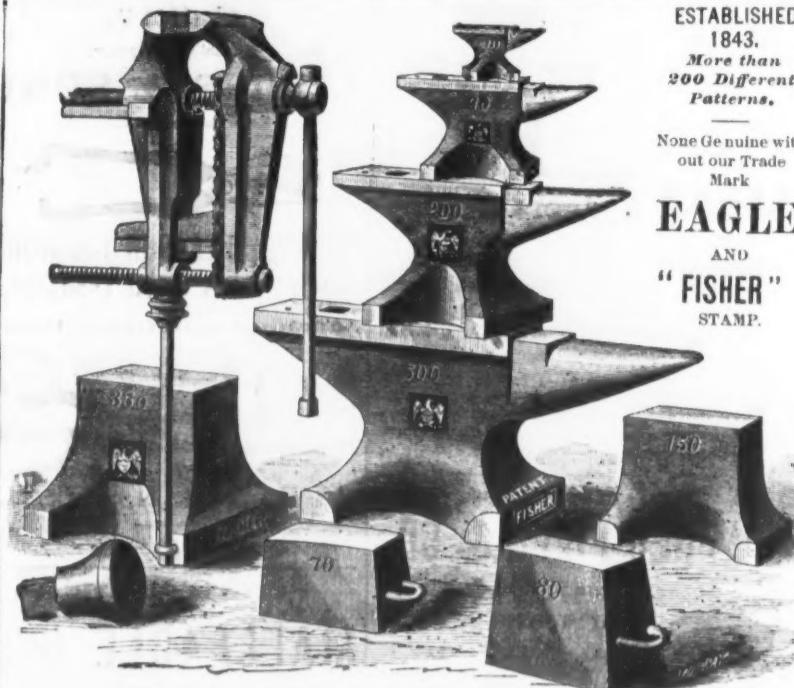
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that his judgment should be satisfied. In this case—Harmon vs. Page—the Supreme Court of California decided in favor of the creditor. The Chief Justice (Morrison), in the opinion, said: "It is too late, after the investment is found unprofitable and debts incurred, for stockholders to withdraw their subscriptions. They being in general free from personal responsibility, the capital stock constitutes the sole fund to which the creditors look for a liquidation of their demands. It is the basis of the credit which is extended to the corporation by the public, and a substitute for the individual liability which exists in other cases. So far as the creditors are concerned, it is regarded in law as a trust fund, pledged for the payment of the debts of the corporation. If, therefore, by the willful or stubborn inaction of the directors or stockholders the company fail to meet their obligations or perform their duties, a court of equity will afford the requisite relief."

STOCK LOANED—BORROWER USING IT AS COL-LATERAL SECURITY—RIGHTS OF CREDITOR.

A, an owner of shares in a corporation, lent the certificates for it to B, signing the power of attorney on the back of the certificates in blank. This power contained the usual authority to sell and transfer the stock. B used this stock as security for a loan from G, giving him the certificates, with the powers of attorney, as he had received them from the owner. The loan to B was not paid, and after the death of A his administrator filed a bill in equity to have the stock in G's hands declared the property of A, and to compel the delivery of the certificates. The court below decided in favor of G, and the case—Otis vs. Gardner—was appealed to the Supreme Court of Illinois, which also decided in G's favor. The Chief Justice (Scott), in the opinion, said: "The rightful possession of the certificates, with the blank indorsements and powers of attorney thereon, would give the holder authority to fill up the blanks and have the stock transferred to him on the books of the corporation. Had that been done it would have passed the legal title to the assignee; and equity will certainly give the assignor no relief against the sale or pledge of the stock in good faith, although the assignee may never choose to have the stock transferred to him under the by-laws of the corporation."

The Keystone Rolling Mill, at Reading, which has been idle for the past two months, will start up soon.

The new foundry and stove works at Newcastle will probably get into operation by April.

Once more it is reported that Major A. B. De Saulles has resigned his position as vice-president of the Dunbar Furnace Co., to take effect April 1st.

The tube works of J. M. Downing & Co., at Newcastle, stand upon leased ground, and the lease being about to expire, the citizens of Mercer have made offers to the firm with a view of having the works located in their town. Newcastle has as yet made no effort to retain the works.

Stack No. 1 of the Henry Clay Furnaces, at Reading, which has just been reared, met with an accident on March 7, part of the new lining falling in. The bricks are reported to have been very poor. The furnace is probably in blast again by this time.

Sheridan Furnace, near Reading, met with a similar accident last week. The cave-in was, however, of greater dimensions, and the work of repairs will occupy some weeks.

A new factory for the manufacture of barbed wire fence, nail rods, wire, &c., is to be erected this season at Beaver Falls. The articles of manufacture are to be made from Bessemer ingots made at the Edgar Thomson Steel Works. The capital stock of the concern will not be less than \$500,000, besides a number of valuable patents already in possession of some of the members of the company. Among the gentlemen interested are Andrew Carnegie and Henry Phipps, of the Edgar Thomson Steel Works; H. W. Hartman, formerly of the Gautier Wire Works, of Johnstown; J. L. Ellwood, wire-fence manufacturer, of New York; Mr. Stiles, of Chicago, and Mr. Sears, of Wisconsin. Twenty acres of ground have been purchased at Beaver Falls, whereon the works of the new concern will be erected.

#### PITTSBURGH AND VICINITY.

The articles of association of the "Anchor Transportation Company" have been filed for record in the County Recorder's office. The articles set forth that the corporation is formed for the purpose of building ships, vessels and boats, and the carriage or transportation of persons and property. The business of the said corporation is to be transacted in Stowe Township, Allegheny County. The larger proportion of the stock is divided between the Economic Society and Wm. A. Robinson, of Allegheny, the former holding 445 and the latter 365 of the 1000 shares. The capital stock is \$50,000.

It is stated that a company has been formed by employees of Chess, Cook & Co., for the purpose of starting a new tack factory.

#### VIRGINIA.

A corporation to be known as the Rorer Iron Co. has been organized at Roanoke, with Ferdinand Rorer, of Roanoke, president; Samuel Coit, of Hartford, Conn., vice-president; J. H. Sykes, of New York, treasurer; Lucian H. Coke, of Roanoke, secretary. Directors—G. M. Bartholomew, Samuel Coit, of Hartford, Conn.; George N. Gray, of Inton, Ohio; E. G. McClannahan, G. Rorer, Roanoke. The Rorer Iron Co. own 3000 acres of land, most of which is rich in magnetic iron ore, situated in Cave Spring district, the western portion of Roanoke County, among which is the Joseph A. Gale property, on which a mining town known as Gale is being founded. Gale is about four miles from Roanoke. The company will build a narrow-gauge railroad at once from their mines at Gale, by way of Mr. G. W. Haworth's farm, to intersect with the Shenandoah Valley Railroad in the west end of Roanoke. On the Roanoke River the company will erect, as early as practicable, a large furnace, which will be on the line of their narrow-gauge railroad.

#### OHIO.

The Ohio Falls Iron Works, New Albany, closed down for repairs December 30. They made 8204 tons finished iron during the year 1882, and sold during the same time 8204 tons. They have again resumed operations.

The Youngstown Steel Co. made a test of their new plant last week, which was evidently satisfactory in every respect, a fine quality of steel being produced. At present they employ but 30 men, but the force will soon be increased.

The Thomas Furnace, operated by the Arnold Furnace Co., with Mr. W. R. Drake as manager, is again in full operation. On the 20th of November last the top of the furnace fell in, making a stoppage of operation necessary. At that time the furnace was making only from 35 to 40 tons of iron per day. When repairs were commenced the proprietors conceived the idea of enlarging the furnace and thereby increasing its capacity. Consequently the work of rebuilding was commenced immediately. The stack of the furnace was raised 15 feet, making it now 70 feet high, with a bosh 16 feet, the old water hoist was taken out, and a new steam hoist and safety cages put in; a new bell and hopper, much larger than the old one, have been placed on the top of the furnace; a new battery of boilers has been added, and another new set of boilers will be placed in position in a few weeks; a new smoke-stack 85 feet high has been built, and new steam, gas and air pipes added. The furnace now is in the best possible condition, and has a capacity of 75 tons of iron daily.

The furnace manufactures the celebrated "Arnold" iron, which is a soft, strong all-iron foundry iron, combining all the peculiar properties of the best grades of Scotch foundry metal, as regard fluidity and softness, with nearly, if not quite, the strength of No. 1 Bessemer iron. These favorable results are attained by the use of the famous Mineral Ridge black-band ore and the celebrated Arnold magnetic ore from the Adirondack Mountains, New York. It excels any other iron now in the market for stove plate and light machine castings.—*Niles Independent*.

It is stated that W. D. Wood & Co., of Pittsburgh, are about to erect a new mill near the Wellsville Plate and Sheet Iron

## THE Greenfield Vertical Engine

is unequaled by any other in workmanship and quality of material.  
2½ to 30 horse-power.  
Prices lower than any other first-class engine.  
**COOKE & CO.,**  
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In writing, please mention this paper.

**WM. FLACCUS & SON, Pittsburgh Pa.**  
Manufacture every variety and all sizes  
Blacksmith's Bellows  
Superior Quality, covered with best Oak Leather Tannage.

Face in one piece of BEST TOOL CAST STEEL, PERFECTLY WELDED, perfectly true, or hardest temper and never: come off or "settle." Horn of tough untempered steel, never to break or bend. Only Anvil made in United States fully warranted as above.

**FISHER DOUBLE-SCREW VISE**  
IS FULLY WARRANTED STRONGER THAN ANY OTHER LEG VISE, AND ALWAYS PARALLEL.  
Is the best Vise for Machine Shops and Blacksmiths, and for all heavy work. ACCURATE AND DURABLE. Send for Circular.

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Maker and Pattee of the improved

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Roller Tube Expanders and Direct Acting Steam Hammers.

Communications by letter will receive prompt attention.

Jacks for pressing on Car Wheels or Crank Pins made to order.

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With Patented O. G. Border.

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Manufactured of heavy metal, requiring no nailing or lining, the edge retaining its form. Superior pattern, finish and quality. Price as low as any.

Send for List and Discount.

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MANUFACTURERS OF

**PURE ELECTRIC WIRE,**

For Magnets, Telegraphs, Telephones, &c.

Insulated on the bare wire with H. Splitdorf's patented Liquid Insulation, covered with cotton or silk.

All sizes of Bare and Covered Wire in Stock.

The conductivity of every bundle tested and warranted.

**THE ANSONIA WROUGHT GONGS,**

For Clocks, Indicators, Telephones, Call Bells, Bell Punches, Steamboat and Railroad Use. Burnished or Nickel Plated.

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**THE ESSEX HORSE NAILS**

Are drawn from the Best Norway Iron Rods only. They are hot forged and cold-pointed, rendering them both tough and stiff, and are warranted.

**FIRST-CLASS IN EVERY RESPECT.**

By the use of improved machines we forge Fifty per cent. More Nails on a machine than any other company, and are thus enabled to sell them proportionately less than any other nail of equal quality. All nails branded ESSEX fully guaranteed.

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Manufacturers of "Defiance" Patent Adjustable Planes.

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**Aiken & Drummond Patent Power Molding Machines**

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Fine Gray Iron Castings, Iron Toys, Metal Patterns &c.

**ESTERBROOK'S STEEL PENS**  
Leading Numbers: 14, 048, 130, 333, 161.  
For Sale by all Stationers  
THE ESTERBROOK STEEL PEN CO.,  
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The only exclusive manufacturers of  
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101 CHAMBERS STREET,  
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BUTCHERS' KNIVES,  
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Wood, Machine and Rail Screws, Stove and Tire Bolts, Rivets, &amp;c.

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For heavy bedsteads, book-cases, flower stands, refrigerators, safes, sideboards, desks, or very heavy furniture. Also for heavy ice chests, magazine boxes, stone trucks, heavy showcases, beer boxes, or any very heavy weight. Especially adapted for use in beer bottling, fruit canning, tobacco or warehouse establishments, where heavily loaded tables need to be moved.

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"Forty Daisy Trucks in use. Just what we wanted."  
WASHINGTON STAMPING COMPANY.  
Washington, Ohio.TUCKER & DORSEY,  
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## Joseph Rodgers &amp; Sons'

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## CELEBRATED CUTLERY,

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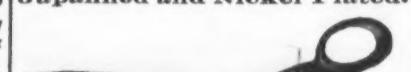
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Manufacture a full line of

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Counter, Portable, Dormant,

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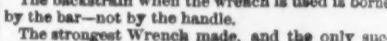
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In addition to Spoons of this well-known brand, we are now prepared to furnish Forks of the same quality. We GUARANTEE these goods to be SOLID and of UNIFORM quality throughout, with no coatings to wear through or flake off, and with no liability to RUST.

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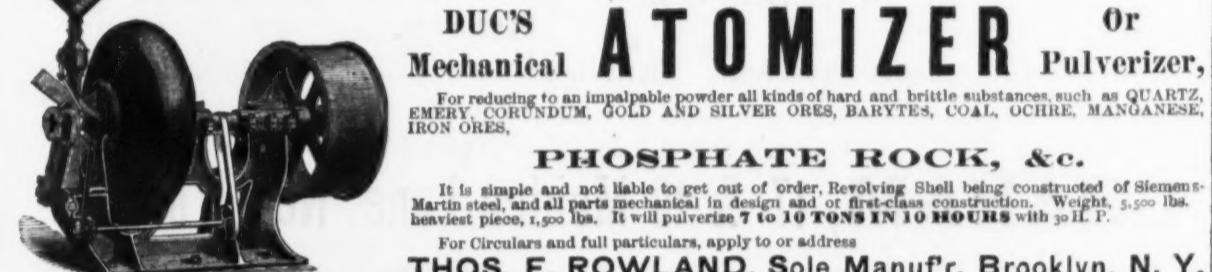


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NOTICE.—We guarantee the base of our Spoons, Forks, &c., to be full 18 per cent. Nickel Silver, and extra heavily plated with pure Silver. Our goods are all hand burnished, and are first-class in every respect. We pack our Spoons and Forks one dozen in each box.

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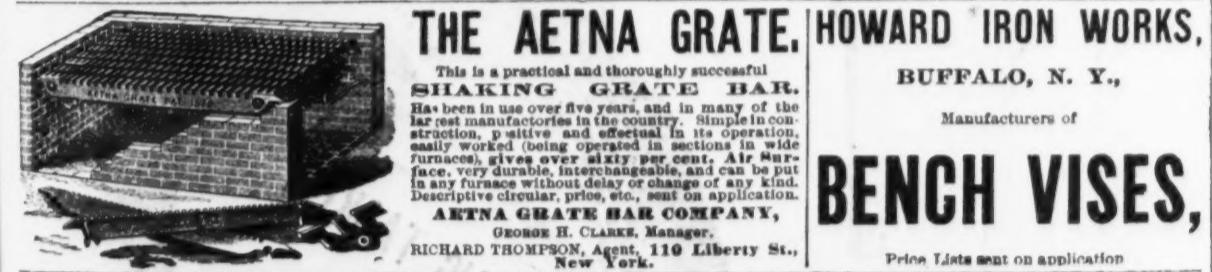
For reducing to an impalpable powder all kinds of hard and brittle substances, such as QUARTZ, EMERY, CORUNDUM, GOLD AND SILVER ORES, BARYTES, COAL, OCHRE, MANGANESE, IRON ORES,

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It is simple and not liable to get out of order. Revolving Shell being constructed of Siemens-Martin steel, and all parts mechanical in design and of first-class construction. Weight, 5,000 lbs. heaviest piece, 1,500 lbs. It will pulverize 7 to 10 TONS IN 10 HOURS with 30 H.P.

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## WESTON'S PATENT HAND-POWER TRAVELING CRANE, FOR FOUNDRY USE.



SOLE MAKERS:

## YALE LOCK MFG. CO., Stamford, Conn.

Circulars on application. Full specification and tender submitted on receipt of capacity and span of bridge desired.

Works, at Wellsville, of which they are the chief owners.

The mill and furnace of the New York and Ohio Iron and Steel Co., at Ironton, were offered for sale at auction on March 1, without any purchaser being found. It is now understood that the company will add a nail mill to their plant.

The new sheet mill at Martin's Ferry will probably get into operation some time this week.

### ILLINOIS.

There is a probability that the Union Iron and Steel Co. will early resume operations, all arrangements having been nearly completed, as indicated in the following circular letter, dated February 28, issued by the directors to the stockholders:

You are hereby notified that at a meeting of the directors of said company, held this day, a resolution was passed calling a meeting of the stockholders of the Union Iron and Steel Co. on Monday, March 12, 1883, at 10 o'clock a. m., at the office of said company, at No. 89 Madison street, Chicago, to take into consideration a proposition of said board of directors to increase the capital stock of said company to \$3,000,000, making all above \$1,600,000 preferred stock, and to draw dividends annually at a rate to be determined by said stockholders, before common stock draws any dividend, and authorizing the payment for said stock either in money or in the indebtedness of said company. It is desired that every share of stock should be represented at said meeting. The president's statement shows assets of said company to the amount of \$5,000,000, and liabilities to the amount of \$3,292,441.42. By order of the Board of Directors.

L. S. BOOMER, Secretary.

The company have a large stock of raw material, and one of the most modern merchant mills, and there is a good demand for the product.

The Chicago Hardware Mfg. Co. propose to increase the capacity of their works 100 per cent. in a month or so.

The ornamental-iron works of J. L. Pfaff, at Quincy, were recently incorporated, under the State laws, as the Aetna Iron Works, with a paid-up capital of \$60,000.

The June Mfg. Co., of Chicago, makers of special machinery, are about to build a new four-story brick factory, which they hope to have ready for occupancy by May 1.

### TENNESSEE.

Messrs. J. C. Anderson & F. H. Caldwell have established in Chattanooga a handle factory, which has been in operation nearly a year and has proved quite successful. The building is 40 x 120 feet. They operate six lathes, which put out 20 dozen daily, consisting of ax, pick, machinists', house carpenters' and coal miners' handles. The firm find the second growth hickory of the Tennessee Valley and mountains on either side the best of material for their purposes, and have a ready sale for their products. They employ 30 hands at the factory, and carry a heavy stock of raw material.

### MISSOURI.

The Standard Foundry Co., of St. Louis, will, on April 1, increase their capital stock. Their new additions will soon be completed, and will largely increase their capacity.

A contract has been made between the Harrison Wire Co. and the Marsh & Harwood Co., of St. Louis, whereby the waste-acid product from the wire works is to be utilized in the manufacture of copperas. A works is being erected near the wire plant for the purpose. It is estimated that the product saved hereafter will be worth several thousand dollars every year.

The Groom Shovel Co., of St. Louis, are running full, single turn. They report themselves so crowded with orders that they are taking none for earlier delivery than April.

### TENNESSEE.

The Roane Iron Co., of Chattanooga, have again shut down their mill, and it is not known when they will resume work. The stoppage is caused by lack of orders; 300 men are thrown out of employment.

### WEST VIRGINIA.

Mr. H. M. Priest has been elected president of the La Belle Iron Works, of Wheeling, vice Mr. W. H. Harden, resigned. Mr. Priest was formerly secretary of the Jefferson Iron Works, of Steubenville, Ohio, which are virtually under the same management as the La Belle.

### MICHIGAN.

Stack No. 2 of the Pioneer Furnaces has been blown out on account of low prices for pig iron, and will be overhauled and repaired during the idleness. The force of wood-choppers has been reduced considerably.

### LABOR AND WAGES.

The rolling mill of Potts Brothers, at Pottstown, stopped five weeks ago because of uncertainty about the tariff, was restarted on March 6. After one heat the puddlers and their helpers refused to work, on account of a notification of a reduction in the wages of the puddlers to \$3.50 per ton, and of 8 per cent. in the wages of the other men. The firm say they "started the mill solely to give the men work, as they had not a single order on hand." Some trouble has also occurred at the mill of the Pottstown Iron Co., owing to a reduction in wages.

The strike at the works of the Centralia (Ill.) Iron and Nail Co. has ended by the strikers accepting the terms of the company.

The workmen of the Springfield (Ill.) Iron Co. held a meeting on March 9 to protest against the action of the District Executive Committee in ordering a strike. Dictation by the Amalgamated Association was repudiated, the strike denounced as unwarranted, and the iron companies sustained by the men in resolutions adopted.

The district meeting of the Amalgamated Association, in Pittsburgh, March 10, for the purpose of considering the scales of wages for the year beginning June 1, was as largely

attended and long drawn out as meetings of that kind usually are. It was called to order shortly after 2 o'clock in the afternoon, and did not adjourn until after 7. When the doors were opened the only information given officially was that First Vice-president Keeny had presided, that E. A. McAninch officiated as secretary, and that 16 delegates to the scale convention had been chosen. This scale convention is the first national gathering of the kind in the history of the association. It will meet in Pittsburgh on the 7th of April, and will formulate the scales, the acceptance of which will be demanded in all districts. The delegates chosen at the meeting, with the 20 representing other sections of the country, have power to arrange the scales, presumably in accordance with the wishes expressed by their constituents. What these are cannot be ascertained officially at this time, but it is stated that while the puddlers and muck rollers are content to work at present wages, the finishers will ask that their scale be based on plate instead of bar iron, on account of the extent to which specialties are manufactured. If this is done their wages will be increased from 15 to 20 per cent. Puddlers say they will not unite in a strike for this purpose, and manufacturers say a demand for any increase will be steadily resisted. Meetings were also held Saturday in Youngstown, Wheeling, Beliefield (Ill.), Covington (Ky.), Philadelphia and one other city. Reports indicate that all were more or less animated, but no particulars, save that delegates to the scale convention were elected, could be obtained.

The 90 employees of the Reading Hardware Co., who a few days ago asked for an increase of 10 per cent. in their wages, received an answer on March 8, granting their request, to take effect March 12. A similar notice was given the proprietors of the Pennsylvania Hardware Works, but they have two weeks' time in which to answer, and the proprietors say they do not intend giving their answer before the end of that time. It is probable their demands will be acceded to.

Employees of Brown, Bonnell & Co., Youngstown, have been paid the money due them for labor performed by them up to the time that the mills were shut down and possession taken by Receiver Brown. The amount paid out reached the sum of \$60,000, and caused a feeling of satisfaction among all classes.

### Gases in Steel Castings.

Dr. Frederick Müller, of Brandenburg, Germany, whose views concerning the question of gases in steel castings were published in our issue of January 25, 1883, has submitted the following reply to M. Pourcel, who, as will be remembered, vigorously attacked Doctor Müller's theory at that time:

Pending the publication of the results of my thorough investigations into the importance of silicon in the metallurgy of iron, I beg to correct a few misapprehensions and errors contained in the published letter of M. Pourcel. That letter criticizes merely the introduction to my paper on the gas secretions in steel castings, and only a secondary matter then. The chief argument of the introduction, viz., the strong secretion of gases from completely decarbonized iron, is not touched upon. I am prepared to prove that pig iron—not white pig alone—poured direct from either the blast or cupola furnace, often gives castings full of blisters. In this, as in other cases, the phenomenon can only be explained on the theory of the secretion of previously absorbed gases, and it is thus incomprehensible why, as regards the intermediate product, the complicated reaction theory should be adopted instead of the absorption theory. Nevertheless, as already stated, these arguments are only of secondary matter then.

The Standard Foundry Co., of St. Louis, will, on April 1, increase their capital stock. Their new additions will soon be completed, and will largely increase their capacity. Pending the publication of the results of my thorough investigations into the importance of silicon in the metallurgy of iron, I beg to correct a few misapprehensions and errors contained in the published letter of M. Pourcel. That letter criticizes merely the introduction to my paper on the gas secretions in steel castings, and only a secondary matter then. The chief argument of the introduction, viz., the strong secretion of gases from completely decarbonized iron, is not touched upon. I am prepared to prove that pig iron—not white pig alone—poured direct from either the blast or cupola furnace, often gives castings full of blisters. In this, as in other cases, the phenomenon can only be explained on the theory of the secretion of previously absorbed gases, and it is thus incomprehensible why, as regards the intermediate product, the complicated reaction theory should be adopted instead of the absorption theory. Nevertheless, as already stated, these arguments are only of secondary importance. The pith of the matter is the absence of carbonic oxide in the pores and the presence of hydrogen and nitrogen.

Now, M. Pourcel does not question the accuracy of my experiments, but nevertheless is continually speaking of escaping hydrogen. I have reviewed the whole of my experiments, not, however, with the idea of refuting M. Pourcel's conclusions, but for the purpose of showing that Mr. Snellus, Mr. Winslow Richards and others are in error in supposing that the large volume of hydrogen given off was due to the decomposition of the water surrounding the borer during the boring. In other respects my paper is not controversial, there being only a few polemical sentences in which I endeavour to defend myself from attack. M. Pourcel, on the contrary, is continually attacking me. Two years ago I was compelled to oppose him and his followers. That matter, however, is now buried. It is not true, as stated by M. Pourcel at Vienna, that I had roughly treated his theory. I had not till then attacked his theory in any way—indeed, I did not know he had propounded any particular theory.

M. Pourcel's published letter addresses itself pointedly to me. "No, Doctor Müller, silicon does not increase the giving off of the gases in steel, but quite the contrary. It will be known to you that Troost and Hautefeuille have established by experiment that silicon almost entirely prevents the release of hydrogen from steel." I reply that Troost and Hautefeuille have only stated that manganese iron melted in an atmosphere impregnated with hydrogen splatters strongly on cooling, while silicious iron does not. From this there can be no other conclusion than that the molten manganese iron in a very high temperature absorbs more gas than is possible at the melting point only. Silicious iron, on the contrary, has no greater absorption capacity at a higher temperature than when cooling. This fact, however, is quite irrelevant to my theory. It is merely a question whether the set metal, largely alloyed with silicon, could retain a greater quantity of hydrogen.

That this is the case the investigations of well-known natural philosophers have already shown: 500 kg. of pig iron took up 46.6 c. cm. of hydrogen; cast steel, 7.8, and hammered iron, 13.9. Quite recently the careful experiments of Professor Ledebur with ferromanganese have shown how silicon enables both alloys to retain a large quantity of hydrogen. It is worthy of remark that this distinguished scientist—a metallurgist, and not, like M. Pourcel's friend, a mere chemist

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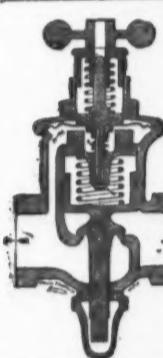
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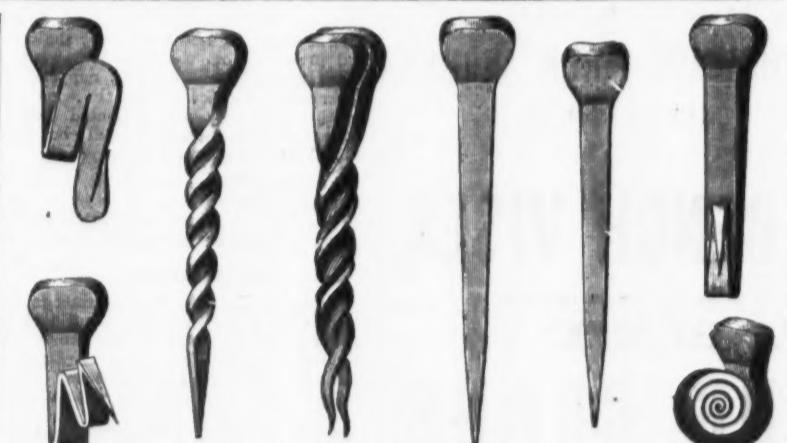
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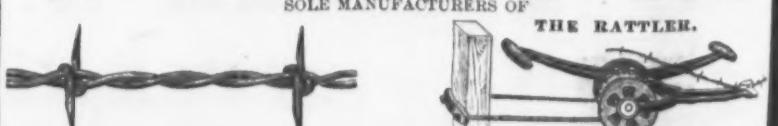
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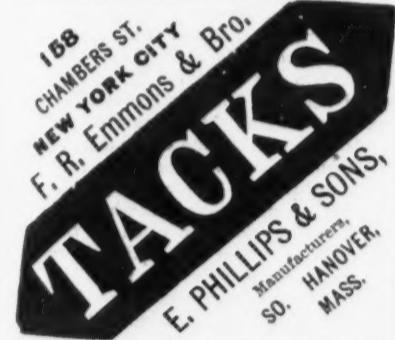
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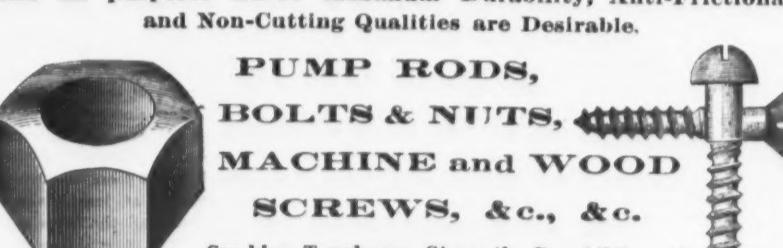
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## Our Imports and Exports of Iron and Steel.

The United States Bureau of Statistics has recently issued a statement from which we compile the following table, showing the value of the imports of iron and steel into this country in the calendar year 1882, as compared with 1881:

Articles.	1881.	1882.
Pig iron.	\$8,943,655	\$9,896,656
Castings.	37,625	115,961
Bar iron.	2,075,151	3,304,607
Cast iron.	6,784	1,200
Band, hoop, &c.	551	88,882
Iron rails.	3,464,639	3,077,559
Steel rails.	7,640,408	5,401,980
Sheet iron.	613,810	294,017
Tin plates.	14,886,609	17,075,101
Scrap iron.	2,705,072	2,736,483
Anchors, chains, &c.	124,390	142,108
Machinery.	84,013	77,906
Gear wheels.	1,739,428	2,975,753
Steel ingots, &c.	45,023	540,159
Cutlery.	42,966	70,732
Files.	1,054,317	2,037,400
Saws and tools.	24,205	34,775
Other manufactures.	5,771,691	6,177,077
Total.	\$61,555,977	\$67,075,125

The weight of all the above articles is not given in the Government reports, but so far as they are to be ascertained, they are as follows:

Articles.	Gross tons.	1881.	1882.
Pig iron.	465,023	540,159	
Castings.	45,023	540,159	
Bar iron.	42,966	70,732	
Boiler iron.	259	156	
Cast iron.	738	5,376	
Iron rails.	123,133	37,493	
Steel rails.	222,597	262,698	
Sheet iron.	7,531	11,254	
Tin plates.	1,054,317	2,037,400	
Scrap iron.	2,705,072	2,736,483	
Anchors, chains, &c.	1,337	142,108	
Total.	1,180,749	2,192,295	

The value of the exports of iron and steel from this country in 1882, as compared with 1881, is shown in the table below:

Articles.	1881.	1882.
Pig iron.	\$184,364	\$186,021
Castings.	45,023	60,668
Bar iron.	35,125	1,851
Boiler iron.	5,528	3,425
Cast iron.	34,862	32,878
Iron rails.	7,123	8,130
Steel rails.	8,895	11,537
Sheet, band and hoop iron.	8,895	11,537
iron.	8,895	11,537
Steel ingots, bars, shafts, and spikes.	45,457	89,076
Nails and spikes.	312,059	380,753
Car wheels.	139,222	149,320
Stoves and parts of stoves.	121,077	121,077
Other castings.	38,005	37,884
Steam engines, stationary.	28,158	183,311
Steam engines, locomotive.	913,932	1,878,528
Boilers, separators.	161,132	183,413
All other machinery.	4,817,093	6,220,344
All other manufactures.	5,766,263	6,490,223
Cutlery.	67,653	61,094
Edge tools.	1,115,756	997,038
Files and saws.	42,355	68,210
Firearms.	1,018,472	927,180
All other manufactures of steel.	562,090	453,494
Total.	\$15,782,902	\$19,020,750

Of the above articles, the weight of all that can be ascertained was as follows in 1882, as compared with 1881:

Articles.	Gross tons.	1881.	1882.
Pig iron.	6,158	5,376	
Castings.	45,023	540,159	
Bar iron.	420	758	
Boiler iron.	69	37	
Cast iron.	513	2,158	
Iron rails.	77	671	
Steel rails.	77	671	
Sheet, band and hoop iron.	102	108	
Steel ingots, bars, sheets and wire.	210	448	
Nails and spikes.	3,010	3,010	
Total.	11,538	13,766	

It would be very satisfactory to be able to make comparisons from year to year of our imports and exports of iron and steel by weight, but that is not possible, for a variety of reasons. One reason is that the Bureau of Statistics does not obtain nor publish the weight of some of the heavy products, the duty on which is levied at an ad valorem rate, and not at so much per pound or per ton. Another is that a great many iron and steel articles are sold at an individual price, and not by weight. In dealing with import and export statistics, therefore, it is inevitable that values be compared, especially when reference is made to the imports or exports in mass, and not in detail.

In the calendar year 1882 the United States imported more iron and steel than in any previous year except two—1872 and 1880. Both of the excepted years were seasons of high-pressure activity, however, while 1882 was a year of steady trade without any excitement whatever. As compared with the imports for 1881, the value of the iron and steel imports for 1882, including tin plate, was \$5,52

duction of 1882 over 1881 was therefore 221,923 tons of ingots and 242,545 tons of rails. The percentage of increase was 16 for ingots and nearly 24 for rails. These figures show that Great Britain made more progress in increasing its output of steel last year than did the United States, for in that year we only gained 10 per cent. in the production of ingots and 8 per cent. in the production of Bessemer steel rails over the product of 1881. For several years the United States has disputed with Great Britain the honor of being the principal Bessemer-steel producing country in the world. In 1880 the mother country was beaten in its manufacture of both ingots and rails. In 1881 it was beaten in the manufacture of rails, but in the production of ingots it surpassed the United States. In 1882 honors were again divided, Great Britain producing the most ingots, but the United States rolling the most rails. The excess of the British production of ingots over the American production last year was 158,955 tons, and the excess of the American production of Bessemer steel rails over the British production was 19,284 tons. If, however, the comparison were confined to rails rolled from homemade blooms, the excess would be on the side of Great Britain, as some of our rails embraced in the above calculations were rolled from Transatlantic blooms.

#### Our Mexican Trade.

Some very interesting problems are presented in our future trade with Mexico. As matters stand, merchants in the United States are severely handicapped by English and French steamers, subsidized by their respective governments to the tune of about \$20,000 per trip, and a German line is soon to be started which will receive \$16,000 per trip. Of course, the effect of these subsidies is equivalent to a reduction of the rate of freight by our European competitors. The Mexican Government also, by virtue of an agreement made with the American line of steamships, fixes the rate of freight from Mexico. It is in consideration of this right that she grants \$2000 a trip, whether the steamer sails from New York or New Orleans. We understand that the American steamship proprietors apprehend still further disadvantages, to arise from efforts making in England to obtain a further control of Mexican trade. Already an agent is seeking to renew more friendly relations, with the object, it is alleged, of establishing a counterpoise to American influence.

A curious fact is stated by the Messrs. Alexandre, of the American line to Vera Cruz, illustrative of the present state of our trade relations with the Mexican Republic, to the effect that there was a time when the house of Collins & Co., of Connecticut, used to supply almost the whole of the Mexican demand for axes, machetes, or long knives, used by the peons and Indians, and cutlery generally. When the tariff came into operation this trade was cut into such an extent as to almost ruin it. To show the extent of Collins & Co.'s business, it is mentioned that the Germans are selling to-day in Mexico axes and machetes having the Collins trade-mark and label upon them, although they are made in Germany. A business connection must be large before it becomes a paying matter to do this. As a remedy for existing difficulties the Messrs. Alexandre propose an extension of the bonding principle. They say that if a manufacturer who exports \$1000 worth of manufactured goods were allowed to bring in duty free, or with lessened duty, an equal amount of raw material, it would permit competition with European manufacturing centers. There used to be a rule by which high-grade refined sugars were allowed a rebate of duty— $\frac{1}{2}$  per cent.—less 10 per cent. Under this rule there grew up a large trade in sugars of this kind. Raw sugars were imported, refined and exported, and the profit permitted the payment of the 10 per cent. of the duty. Could such an arrangement be made for all manufacturers it would stimulate them in many ways.

Mention is also made of the pernicious working of our consular system, which encourages extortionate fees. An item of \$5 for a consular seal is a trifling tax on a shipment of goods worth \$200,000, but it is 5 per cent. on an invoice of only \$100, and enough to absorb no small share of the profits. Mr. Trescot and the other commissioners appointed to confer with the Mexican Minister Romero respecting our international trade relations, will find several delicate questions which require adjustment before trade with Mexico can be put on a basis promising much satisfaction or permanence.

#### Commerce of the Dominion.

The trade and navigation returns for the year 1881-82 were laid before the Dominion Parliament a few days ago, and show some unexpected results. Both the export and import trade have largely increased during the year, the former beyond precedent, and the latter was only exceeded in the years 1873, 1874 and 1875. It is also observed that exports to Great Britain have largely fallen off, while those to the United States have increased, and the imports from the United States have meanwhile increased in a greater ratio than those from Great Britain—indicating that, despite the encouragement given to commercial relations with "the

mother country," the people of the Dominion are becoming more closely allied in their material interests with whatever concerns their neighbors across the St. Lawrence boundary.

The value of the Dominion exports by countries in 1881 and 1882 was:

	1881.	1882.
Great Britain	53,751,570	45,274,461
United States	30,866,235	47,940,717
Other countries	7,673,028	8,922,023
Total	98,290,823	102,137,203

The following shows the imports for consumption:

	1881.	1882.
Great Britain	43,583,808	30,597,342
United States	35,704,112	48,289,052
Other countries	11,323,084	13,702,514
Total	91,611,604	113,689,927

It will be observed that the increased value of goods entered in 1882 is \$21,037,323, compared with the previous year; and if we go back to the date of confederation in 1868, the total excess of imports in the intervening period over exports is \$282,877,898, as appears from the following:

	Exports.	Imports.	Duty.
1868	\$57,567,898	\$73,459,444	\$8,819,431
1869	60,474,781	70,415,165	8,208,929
1870	73,573,499	74,814,339	9,462,940
1871	74,173,618	66,018,971	11,843,055
1872	89,630,665	111,430,527	13,045,423
1873	89,789,028	108,111,582	13,017,730
1874	89,213,548	128,213,548	14,427,000
1875	77,806,970	123,079,833	15,161,851
1876	80,066,415	93,310,346	12,548,451
1877	75,875,903	90,137,903	12,548,451
1878	76,323,667	93,081,187	12,793,623
1879	77,401,255	81,664,497	12,793,540
1880	87,011,458	86,489,747	14,138,840
1881	98,290,823	105,330,840	18,500,785
1882	102,137,203	119,419,500	21,708,837
Total	\$1,301,454,503	\$1,484,332,401	\$199,736,698

Financial authorities in the Dominion differ respecting the bearing upon the general prosperity of the continued large adverse balance of trade. On one point, however, they are agreed, and that is in an expression of satisfaction upon finding a surplus in the public Treasury of \$6,300,000 at the end of the last fiscal year, the receipts having been, in round numbers, \$33,300,000 and the expenditures \$27,000,000. Moreover, notwithstanding a temporary dullness in trade and some stringency in money, it is generally admitted that in comparison with former years, under a different financial policy, the manufacturing industries are prosperous, wages are more liberal and better prices are realized for goods. The statistics presented by the Factory Commission of Ontario, in the report giving the results of their investigations, sustain this view. The circumstance is used as an argument that a favorable time has arrived for a revision of the tariff.

#### "The Iron Age" and Mr. A. S. Hewitt.

The *Engineering and Mining Journal* of March 10 contains the following communication editorial, written by Dr. R. W. Raymond—a note at the head of the paper explaining that for all articles "signed thus" that gentleman is responsible. We congratulate his associates in the management of the *Journal* on the fact that Doctor Raymond has relieved them from any share of the responsibility in this instance:

An anonymous correspondent of *The Iron Age* attacked Hon. A. S. Hewitt in the following words (February 13th):

"As usual, Mr. Hewitt attempts to mislead the public as to his interests in the iron trade, by pretending to be principally engaged in mining iron ore and making pig iron, whereas these operations are secondary to his main business of rolling iron and steel and drawing wire at Trenton, N. J. He probably consumes five times as much crude metal as he makes in his blast furnaces in New Jersey." To this Messrs. Cooper, Hewitt & Co. replied, in a letter published in *The Iron Age* of February 22d.

"As a matter of fact, when our furnaces are in blast, as they usually are, we make nearly twice as much pig iron as we consume of pig and scrap together in our works at Trenton, N. J. If the defenders of unnecessary duties upon iron ore and scrap iron have no better weapons to rely upon than such deliberate falsehoods as your correspondent has uttered, they had better submit gracefully to the inevitable removal of all obstructions to the production of cheap iron, which is indispensable for the continued progress of the country. Yours, &c.,

COOPER, HEWITT & CO.

elements in the real question, whether Cooper, Hewitt & Co. "consume five times as much crude metal as they produce," or not. By ignoring it altogether and misrepresenting other facts, the foundation is laid on which a respectable journal permits Messrs. Cooper, Hewitt & Co. to be accused of lying, for the purpose of securing on false pretenses the passage of laws which would benefit their business.

The unknown sharpshooter who thus fires from behind *The Iron Age* assumes the capacity of the New Jersey furnaces at 20,000 tons and their product at 10,000. The Durham furnace, which he excludes (though the catalogue of the American Iron and Steel Association, his pretended authority, mentions it in two places in its New Jersey list), produced in 1882, in about 10 months of running, 27,264 net tons of pig iron, or at the rate of \$32,717 net tons per annum. The product of the last six months of 1882 was 16,454 net tons, or at the rate of \$19,838 tons per annum. It is now producing at even a larger rate. These figures, by the way, are probably the best that have been attained in continuous running through long periods by an anthracite furnace with iron hot-blast stoves. They reflect much credit on Mr. B. F. Fackenthal, Jr., the manager of the Durham Iron Works, and we presume *The Iron Age* will be glad to publish them as a matter of news, whatever be said to bound or not bound to do as a matter of justice.

The tariff struggle being over for a time, the advocates of higher duties on iron ore having succeeded in getting a small increase, the necessity for employing, as arguments of political economy, personal attacks upon character and motives has probably passed away, and after the publication of *The Iron Age's* apology the "incident," as the French say, will be concluded.

We should be quite content to reprint this article without answer had the *Engineering and Mining Journal* reprinted the statements of *The Iron Age* which it claims to refute. No one knows better than the clever skirrisher who skillfully dodges every essential question in dispute, how much safer it is to pick out a sentence here and there and dance around it than to answer an article in its entirety. However, we do not expect fairness in the *Engineering and Mining Journal*, having never had it in the past.

The facts are briefly as follows: In our issue of February 8 we printed without comment Mr. Hewitt's letter to Mr. S. S. Cox, and which was read by that gentleman in the House. We did this, not because we thought the letter had any value, or was likely to have a feather's weight in influencing the action of Congress, but because we thought that, as Mr. Hewitt had spoken as a Member of Congress on a subject of public interest, and especially of interest to our readers, he was entitled to be heard in his own words. In our next issue we printed a letter from a disgusted reader, who is prominently identified with iron mining in New Jersey. Mr. Hewitt had spoken as a Member of Congress on a subject of public interest, and especially of interest to our readers, he was entitled to be heard in his own words. In our next issue we printed a letter from a disgusted reader, who is prominently identified with iron mining in New Jersey. 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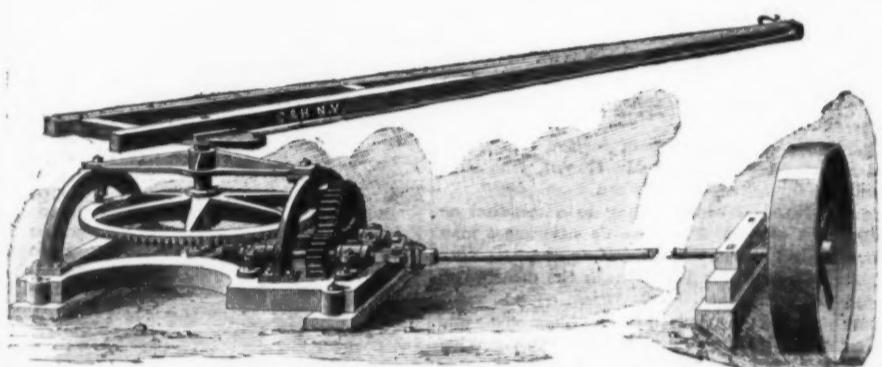
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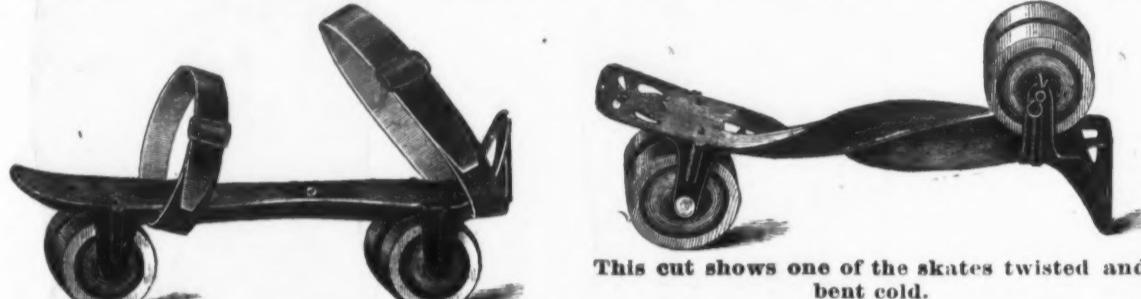
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## Opinions Concerning the Influence of the New Tariff.

The following brief statement of the views of representative men in certain important lines of manufacturing respecting the probable effect of the new tariff on the interests they represent will be found instructive:

### BESSEMER AND OPEN-HEARTH STEEL.

Hon. Daniel J. Morrell, of the Cambria Iron Co., Johnstown, Pa., president of the American Iron and Steel Association, says: "The immediate effects of the change in the tariff have been largely discounted, and the final passage of the bill and adjournment of Congress will very likely bring temporary relief to business generally. The changes made in the metal schedule must ultimately prove disastrous to several of these industries. Works that are not exceptionally favored by location or the possession of extraordinary advantages as to cheap material, &c., will be closed and the capital invested in them will be lost. The rate established on steel rails must shut out from all American mills the markets of the South Atlantic States and all the Pacific States and Territories. Manufacturers of steel and iron asked only for such protection as would be equivalent to the difference between the cost of labor here and abroad, and the Tariff Commission, I believe, conscientiously sought to arrange the schedules reported by them upon the principle of giving protection in exact ratio to the labor expended in advancing crude materials to finished products. The Commission also sought to reduce rates to the lowest possible limit of safety, and aimed to protect manufacturers from the ruinous effects of evasions of fixed duties by false valuations, &c., but Congress saw fit to destroy the symmetry of the Commission's work and to remove all safeguards it had provided against fraud, the schedules as adopted being obscure, contradictory and difficult of interpretation. The flagrant Treasury decisions, by which the revenue was robbed and our manufacturers injured, have been legalized, and opportunities for fraud have been increased a hundred-fold."

"The rates on Bessemer and open-hearth steel ingots, blooms, billets, &c., and on wire rods, hoop iron and cotton ties, are such as must keep these industries, if maintained at all, in a condition of peril for the owners and poverty for the operatives. No pretended interests of consumers can justify such legislation, for no interest will be served by it, and it bears the ineffaceable stamp of ignorance and malice. No manufacturing industry has done so much to develop the wealth and resources of the country as that which is now attacked. It has reduced the cost of steel rails to the railroad companies to one-fourth what it was when the Bessemer works were first started here; it has saved to the nation hundreds of millions of dollars in money that would have gone abroad if the railroads could have been built without its aid. And now the manufacture of rails is checked and the further utilization of steel in place of iron is prohibited, unless conditions to which no other industry is subjected can be borne by the capital and labor employed in this business. Consumers of steel rails have not asked for such a great reduction in the duty, and, so far as I know, not a single railroad manager of any repute has wished for a tariff rate lower than the manufacturers themselves were willing to accept."

"To state clearly the far-reaching effects of this legislation, as business men must apprehend and fear them, would take more time than I have to spare, and more space in your paper than you would be willing to give. Stupidity reigned throughout the discussion at Washington, and it still characterizes the criticisms of the measure in the newspapers. The country will learn by experience how to value the wisdom of its legislators who propose to reduce the revenue by increasing the imports, to cheapen commodities by destroying home competition in their production, to benefit consumers by depriving them of the principal market for their own products, and to render one industry prosperous by obliterating another."

### Views of Pittsburgh Merchants.

At Pittsburgh the iron and steel manufacturers were not much inclined to discuss the effect of the tariff on their particular business, chiefly for the reason that, owing to many changes in classification, it was rather difficult to arrive at any decided views as to what its effect would be on particular lines of business. The general expression, however, not only of those whose views are given below, but of those who refused to state over their own names their opinion, was to the effect that the bill would be injurious to quite a number of interests, more especially to the steel interest and to the pig-iron industry, by reason of the large importations of scrap and finished articles that would result from the lower duties. The following statements, however, give in general the views of the best informed manufacturers of Pittsburgh:

### PIG IRON.

Mr. A. H. Childs, a broker of pig iron, representing several Fayette County furnaces, is of the opinion that the effect on the direct importations of pig iron will be very slight, the reduction, which is 28 cents a ton, being no more of a change than may come any day in the ordinary course of business, but so far as the reduction in rates affects the general iron trade by decreasing the production of the country, in so far it will be injurious also to the pig-iron trade by decreasing the demand for pig iron. The heavy reduction on scrap iron of \$1.25 will also have its effect in encouraging importation of scrap iron, and consequently decreasing the demand to that extent for American-made pig iron.

Nimick & Co., who represent a large number of furnaces in various parts of the West, are also of the opinion that the reduction of duty on pig iron is so slight that it will have very little effect on the importations of pig iron itself, but the importation of scrap iron will probably be largely increased, which cannot but affect the demand for American pig iron. They are also of the

opinion that the furnaces will be injuriously affected by the lower prices that the manufacturers of other iron, on which the duties have been reduced, will demand in order to compensate for the reduced prices at which they must sell their goods by reason of the lower tariff. In the reduction of cost of production that must come, pig, labor and everything else must suffer.

### HOOP IRON.

J. Painter & Sons, who are the largest manufacturers of hoop iron in the country, stated that it was too soon after the passage of the bill to make any change that may occur manifest. Its effect on cotton ties would, of course, be to prevent the manufacture of any in this country, but these have not been made here to any extent for three years and a half, so that, so far as cotton ties are concerned, the effect of the bill is to destroy a hope or a possibility that the 35,000 tons needed to bale the cotton crop of the country would be made here. Of course, if the rate of duty had been such that these ties could have been made here, it would to that extent have given the cotton-mills orders and reduced the competition for orders for other grades of hoop iron. The new classification of hoop iron will require very close working on some sizes to retain the trade in this country. Such sizes as  $\frac{1}{2}$  inch x No. 20 and  $\frac{1}{2}$  x No. 10-in fact, the whole of the second classification between No. 10 and No. 20, with the new rates, bears very heavily on the hoop-iron manufacturers, and between these sizes is included a great deal of hoop. They believe it probable, however, that the provision levying  $\frac{1}{4}$  cent per pound duty extra on all manufacturers of hoop iron would be in a degree beneficial.

### GENERAL MERCHANT IRON.

Mr. B. F. Jones, of Jones & Laughlin's, believed that the general condition of the country was so good that the tariff, though decidedly wrong in many of its provisions, will not have a disastrous effect at the present time, though it will compel lower prices on many forms of iron and steel than would have ruled under the old tariff. At the same time, however, it will have a beneficial effect in preventing the extension of old works and the building of new, and will also lead those who have money to loan to be more conservative in their dealings.

### SHEET IRON.

Mr. P. H. Laufman stated that the new tariff is decidedly injurious to the sheet-iron industries. It has not only largely reduced the duty on sheet iron No. 29 and less, averaging from \$5 to \$7 a ton reduction, but, by continuing the rate of 30 per cent. on tapers iron, it has destroyed all prospect of making any of that iron in this country. The result will be that there must be a readjustment of prices in order to meet the prospective competition from England. The sheet men have already discounted this to a large extent, but there must still be a readjustment that will require lower profits, lower materials and lower wages.

### STEEL.

Mr. Jas. Park, Jr., of the firm of Park, Bro. & Co., who has watched the course of legislation at Washington very closely this winter, is of the opinion that the new tariff bill is very confusing, that it will be very difficult of application to importations, and will result in bringing more cases of appeal before the Treasury Department than were ever known under the old law. Its effect on crucible steel he stated to be very bad, because of the classification adopted and the ad valorem rate of 45 per cent. levied on all steel valued at 4 cents a pound or less. This violates the principle that was adopted by the Tariff Commission of striking the ad valorem rates out of the tariff and adopting specific, and is also a direct bid for undervaluation. It also very materially reduces the duty on the higher grades of crucible steel, or that valued above 10 cents per pound. This reduction, Mr. Park estimates, will amount to 35 per cent. on these grades of steel. It will also bear especially hard on Bessemer and open-hearth steel, perhaps more so on these than on any other form of iron or steel. Billets and blooms for boiler plates and other articles that have heretofore paid  $\frac{1}{2}$  cents duty will now pay only 45 per cent. and the same is true of all merchant articles made from open-hearth and Bessemer steels, such as rounds and squares and sheets and rods; these have paid 2 cents heretofore and will now pay but 45 per cent. ad valorem, with all the inducement to fraud that an ad valorem rate brings with it.

### Views of Philadelphia Merchants.

Messrs. Wm. & Harvey Rowland, manufacturers of springs, steel, rerolled Norway iron and nail rods, say:

"It is too soon to express an opinion about the new tariff. We think our manufacturers will get a fair share of the trade. Quite a large amount of the orders we receive one day are wanted (if not the next day) quick, and we think that where one size was ordered 30 years ago, about 100 sizes are now wanted and in smaller quantities; this is worth something to our people, notwithstanding the cable and steam."

Mr. David Reeves, president of the Phoenix Iron Co., says:

"In our opinion the tariff bill as passed is injurious to the iron and many other trades, and we are disappointed that a Republican Congress did not adopt a better one. While we would not have objected to reductions on some rational basis, we believe that the new tariff is not so framed. We look upon protection as beneficial to the whole people of this country, and consider that this principle was entirely lost sight of by the makers of the new law."

Messrs. James Rowland & Co., of the Kensington Iron, Steel and Nail Works, say:

"We think that no good can come out of newspaper views on the tariff question. It is fixed that we must accept the new tariff law, whether satisfactory or not. All that can be said for or against it can have no other influence than to keep up a disquieted condition of business. We hope the newspapers will give us a rest on said question."

Messrs. J. Wood & Bros., manufacturers of planished sheet iron, say:

"We are under the impression that the new tariff bill will not affect the iron trade

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PREPARED  
ROOFING**

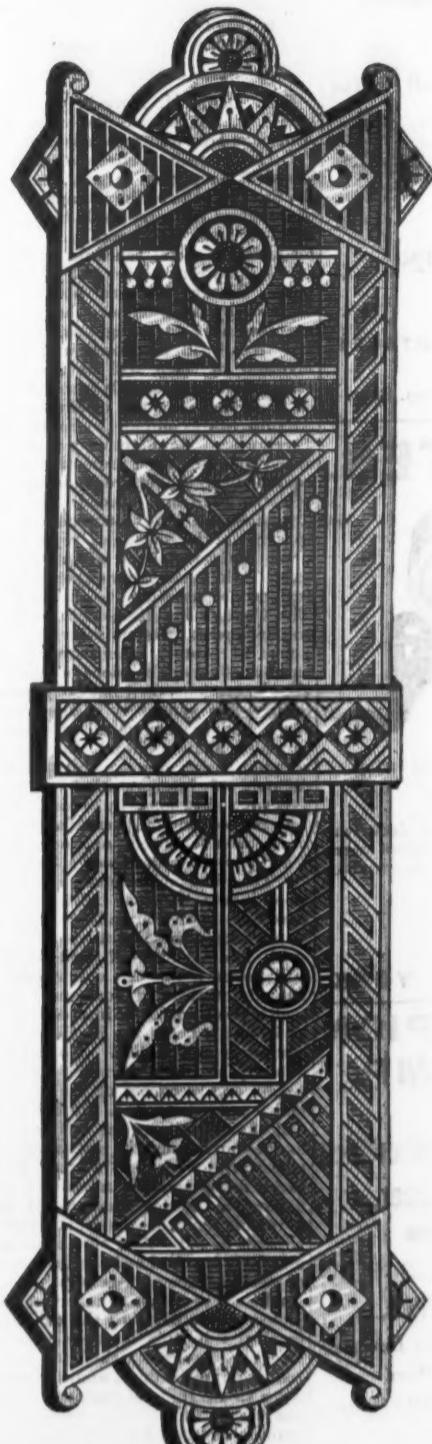
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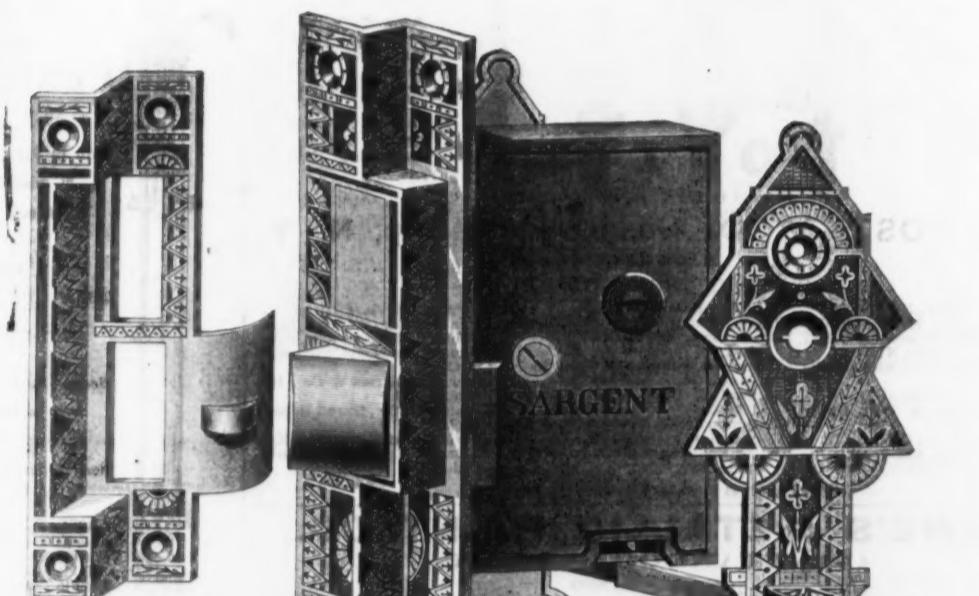
Push Plate, Nos. 823 and 829.



Door Pull, No. 597.



Door Pull, No. 598.



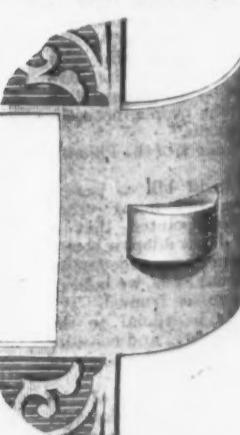
Anti-Friction Strike.



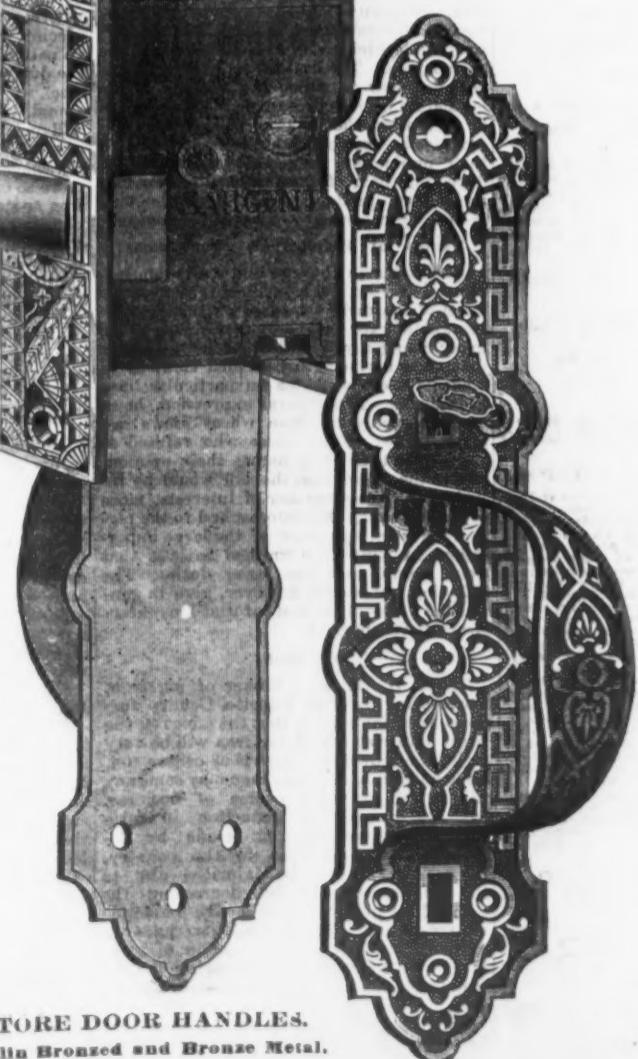
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Philadelphia

"If the  
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bill."

**SARGENT & Co. HARDWARE MANUFACTURERS.** NEW YORK AND NEW HAVEN, CONN.

much under the present low prices. But if prices should go up to a fair living price, we think considerable iron of some descriptions would be imported. The effect of it, so far as the iron schedule is concerned, will be reduction of wages and expenses of every kind, and low prices of raw materials."

Mr. J. H. Sternbergh, of the Reading Bolt and Nut Works, says:

"In regard to the new tariff, I regard the main element of satisfaction with which iron manufacturers receive it to consist not so much in the amount of tax imposed on the various articles as in the fact that the tariff question is finally settled, and that there will probably be no further agitation on the subject for years to come. With this confident hope manufacturers will at once proceed to adjust their business affairs to the conditions demanded by the new rates, however much they may think the rates unwise as affecting the prosperity of their particular line of business. The rates affecting my own branch of business are sufficient in the main to fairly protect the industry, and that is all that can be asked."

Mr. Henry Whiteley, trustee of the McDaniel & Harvey Co., manufacturers of galvanized sheet iron, says:

"We consider the metal schedule of the new tariff as likely to prove unfair and unequal in its operation, as might be expected from the manner in which it was made.

There has been little or no revision, except possibly in classifications, while most of the reductions made are either on articles not justly entitled to bear them, or else have been so slight as to make no practical difference to either manufacturer or consumer. The next Congress might profitably spend some time in revising the work of the Conference Committee. Raw materials are either advanced in rates (as on ore), or unchanged (as on spelter), or only very slightly affected (as on pig iron), while finished products, except those of New England, bear the brunt of the reduction."

Mr. J. Wesley Pullman, selling agent of the Andover Iron Co., Philadelphia, says:

"The circular which our Eastern Pig Iron Association presented to the Ways and Means and Finance Committees contains my views on tariff rates required on pig and scrap iron. I fear our Eastern (Atlantic coast) furnaces will suffer material damage from the serious reduction of \$1.28 per ton on wrought scrap (say 16 per cent). As 1 ton of wrought scrap replaces about 1½ tons of pig iron, I consider such reduction, further, as a severe blow to one of the highest-paid classes of rolling-mill labor—the puddlers. It is true that the tariff first passed recognizes the claims of iron ore by a specific duty of 75 cents per ton, and as one who took part in the argument upon that subject before the Tariff Commission, it is gratifying at last to have the same duty secured for iron ore as upon bituminous coal. If, however, the effect of reducing the wrought-scrap duty \$1.28 per ton results, as most likely, in putting out of blast many furnaces in the Atlantic States, thereby depriving the iron-ore producers of a market for their ores, the victory will prove a barren one. The iron-ore and pig-iron interests are, or should be, common to both. The representatives of iron-ore constituents must battle in the next Congress for a duty upon pig and scrap iron that will warrant the blowing of our Eastern stacks, or they will find the furnaces cold and the ore mines gradually closed."

Messrs. E. H. Wilson & Co., dealers in iron and railroad supplies, Philadelphia, say:

"In reference to the effect of the new tariff bill upon the iron trade we do not see any material change, nor expect any to take place for lower prices, the tendency being rather to better figures than are now ruling. We do not think the general iron business will be much affected, the parties who will suffer principally being the wire, hoop iron and some steel manufacturers, these industries having certainly been unjustly dealt with, as a rule."

Messrs. Sites & Gill, dealers and brokers in iron, Philadelphia, say:

"We think it rather early to say much regarding the effect of the tariff recently passed. Certainly its passage has given more confidence to both buyers and sellers, though prices are not improved. The small reduction on pig iron will not increase the importation. In regard to scrap, the reduction on which is much more, we think that in all cases the preference would be given to American, on account of its being better selected."

Mr. W. E. S. Baker, of the Duncanau Iron Co., says:

"We think the demand has increased for pig, and prices are obtained more easily, and if 50 cents advance is asked by all it can be obtained. This is especially true in the West, where pig has advanced 50¢ @ \$1. Pig is costing \$1.20 @ \$20, and there is no margin for an isolated furnace. Bars quite active in the interior, if we go down to Pittsburgh price, and sell at 2.2 cents or so—in some cases lower. Here it will be hard to sell at 2.2, as Western iron is offered at 2.15 here. Nail demand checked by the cold weather, but fairly active at about \$3.20; retail is higher and large wholesale a trifle below that—say \$3.20 @ \$3.30 retail; \$3.15 @ \$3.25 wholesale—very few here below \$3.20. The new tariff will make a new schedule of bar extras necessary, but it will not be done before six months or so. It costs \$5.50 at Pittsburgh and \$6 further West for puddling. In the East the same work is done for \$3.50 @ \$4, and how the West can go on at such wages and get less than we for products is a mystery. The settlement of tariff agitation gives more confidence. Orders will come, and cost will be adjusted to suit the new regime."

Messrs. Blakely & Walbaum, brokers, Philadelphia, say:

"If the tariff question is now to be permitted to rest as decided by Congress, we believe that the trade will gradually adjust itself to the new order of things, notwithstanding the inconsistencies of the bill, though, of course, some important branches of the iron and steel trade will suffer materially. Trade has undoubtedly, during the past few months, been damaged more by the uncertainty regarding tariff legislation than it is likely to be by the effects of the present bill."

Messrs. Justice Cox, Jr., & Co., agents for iron works, Philadelphia, say:

"It will hold pig iron down, and there will be little money in the making of it, and more furnaces will be out of blast than in, unless wages come down to something like the same class of workmen are paid on the other side of the sea, and this means lower wages to all workmen in America. There are always large stocks of pig iron in Glasgow and other foreign ports, ready to ship as soon as this market will take it, and our manufacturers of bar, sheet and other manufactured iron will use foreign iron when it gets below the same class of iron in this country; hence the tariff affects pig to a much greater extent than manufactured iron. We think people will go into new enterprises very cautiously for a time, and all this means dull times to American workmen, and we all know that dull times mean low wages and little money floating. But there is little to be said, as the bill has passed Congress and will soon be a law, and we must abide by it. All we can hope for is that the business of the country will be allowed to take care of itself, and not be turned upside down by another Congress tinkering with the tariff. In fact, the greatest blessing to the country would be if Congress did not meet but once in three years."

Messrs. J. Tatnall Lea & Co., iron commission merchants, Philadelphia, say:

"We think that while the new tariff is not as strongly protective as it should be to all the iron interests, and especially pig iron, it is probably as good as could be expected, in view of the fact that there are large portions of the country in which local interests are antagonistic to protection. We see no reason to doubt that business will soon adapt itself to the new rates, and anticipate a good business for this year. Any present dullness comes from other causes, such as over-production in some lines, and a conservative feeling in regard to new enterprises."

#### IRON ORE.

A gentleman prominently identified with ore mining in the East, but who modestly withholds his name, says:

"The ore producers of New Jersey regard the increase of duty on iron ore to 75 cents per ton, more as a guarantee that they shall have the opportunity of supplying their natural market with ore than as affecting an immediate increase in the price of ore. The question was whether they could maintain their standing, as compared with the advanced stages of iron and steel manufacture. They think that the action of Congress demonstrates that iron and steelmakers must expect to depend principally upon native ore as a basis of manufacture hereafter.

Messrs. Lyon, Conklin & Co., Baltimore, say: "We look upon the small reduction as a step in the right direction, but we think the reduction should have been greater. We regard a duty of ½ cent per pound as ample, and are not sure that they should not be put on the free list. We would advocate a gradual reduction looking to that end in the near future. We would hardly like to see the entire duty taken off at once."

lead to a decided improvement in the demand for tin plates, which for some time past has been somewhat irregular.

Mr. Dillon, of Dillon, Folwell & Co., in general terms expressed views in accordance with those previously called upon. He considers prices very weak, however, and thinks the reduction in duty, averaging about 15 cents per box, has already been discounted. Buyers do not appear to be fully satisfied, however, and it may take some time to place business on a firm footing.

Mr. Edwin Ingram, of Gummey, Spering, Ingram & Co., thinks that the country has abundant cause for gratitude in the fact that Congress has adjourned until December, so that business cannot be interfered with by legislative action for that length of time at all events. He is also of opinion that the action of Congress was very significant, in making a reduction in direct opposition to the recommendation of the Tariff Commission. It shows how strong the feeling was against any such measure, and Mr. Ingram thinks that the trade throughout the entire country has been placed under obligation to the Philadelphia merchants for their prompt and vigorous action in pressing the matter to a successful issue in Washington. The entire country will benefit by this reduction, and that without detriment to any interests already established.

Mr. W. P. Hibberd, of W. F. Potts, Son & Co., thinks that the prompt action of the Philadelphia merchants has been the means of averting a serious disaster. An advance such as recommended by the Tariff Commission would have been a calamity to thousands of small manufacturers in every town and village in the land. No article of commerce is in more general use than tin plate, and while it does not interfere with any article of domestic manufacture, it is, in fact, in many respects the raw material of a variety of articles which without tin could hardly be made merchantable articles at all. Mr. Hibberd considers the action of Congress in this matter as in accordance with what the country was led to expect, viz., a reduction of duty. In this all sections of the country are equally benefited; no single industry is injured, while many will feel it as a direct monopoly of it.

good pig of the cold-short variety as is produced anywhere, and this interest has grown with astonishing rapidity in the years since the "boom" set in. It is now far beyond the capacity of local mills and foundries to consume—and in the local list we include Louisville, Southern Illinois and St. Louis—and the general and increasing demand for steel has created especial interest among our ironmasters in movements looking to securing the use of the basic process.

It need surprise no one if Southern Congressmen become especial champions of the bill introduced at the last session to compel the owners of that patent to sell royalties on the same principle that rights of way are secured or other corporate privileges enforced. There is certain to be a strong pressure in favor of this proposed measure, and it will come from the representatives of the iron regions of the country, assisted probably by those especially standing for the agricultural districts.

Whether or not the principle of "condemnation" can be applied to a patent or to property in a patent we do not presume to give an opinion, but it is pretty certain that things demanded by a very great majority of the people are apt to be granted, regardless of their legality or equitableness, and the people can readily be wrought up to clamor for the general use of the basic process, regardless of the wishes of those who hold a

private individuals that is a matter to be disposed of by the States directly concerned. It is proposed, however, by the Senate Committee, to look into the matter. The result of their researches into the economic and reformatory features of the convict-labor question, and its effect upon the interests of labor in general, will in all probability form the basis of legislation, or a report which will place the matter in a more tangible shape than it is now. The members of the committee themselves refer to the subject as one of great interest and importance, and express surprise that the matter had not been taken up before.

#### THE LABOR INVESTIGATION.

It was the intention of the Senate Committee on Education and Labor to continue their investigation of the strikes and labor question at once, but owing to the desire of Senator George, a member of the committee, to superintend the beginning of the season's work on his plantation, it was agreed that nothing would be done until about May. It has not been positively decided whether the investigations will be carried on here or at other points, but the indications, judging from the conversation of members of the committee, are that they will visit the coal and iron-mining regions and principal manufacturing centers. The committee seem to be anxious to see for themselves how the working people in these districts live.

#### TARIFF BILL CONSTRUCTION.

While the duly authenticated copy of the tariff bill from the rolls of the Department of State has not been received, the copies printed by authority of Congress for the use of members have been distributed. There seems to be new revelation in regard to some of the provisions of the new bill. The new rates of duty will go into effect July 1. Again, the act provides that on and after July 1, 1883, Section 7 of the act should be substituted for Title 33 of the Revised Statutes of the United States, as follows:

"That Sections 2907 and 2908 of the Revised Statutes of the United States and Section 14 of the act entitled An Act to Amend the Customs Revenue Laws and to Repeal Moieties, approved June 22, 1874, be and the same are hereby repealed, and hereafter none of the charges imposed by said sections or any other provisions of existing law shall be estimated in ascertaining the value of goods to be imported, nor shall the value of the usual and necessary sacks, crates, boxes or covering of any kind be estimated as part of their value in determining the amount of duties for which they are liable; provided, that if any packages, sacks, crates, boxes or coverings of any kind shall be of any material or form designed to evade duties thereon, or designed for use otherwise than in the bona fide transportation of goods to the United States, the same shall be subject to a duty of 100 per cent ad valorem upon the actual value of the same."

The sections referred to in Section 7—that is, 2907 and 2908 of the Revised Statutes—are not included in Title 33; therefore the Treasury officials construe their repeal to go into effect immediately. Assistant-Secretary French has prepared a circular, which will be sent to customs officers, directing them to take cognizance of the repeal of the law.

#### APPRaisal OF GOODS.

Section 9 of the act will also go into effect immediately. This section provides:

"Sec. 9. If upon the appraisal of imported goods, wares and merchandise it shall appear that the true and actual market value and wholesale price thereof, as provided by law, cannot be ascertained to the satisfaction of the appraiser, whether because such goods, wares and merchandise be consigned for sale by the manufacturer abroad to his agent in the United States, or for any other reason, it shall then be lawful to appraise the same by ascertaining the cost or value of the materials comprising such merchandise at the time and place of manufacture, together with the expense of manufacturing, preparing and putting up such merchandise for shipment, and in no case shall the value of such goods, wares and merchandise be appraised at less than the total cost or value thus ascertained."

#### TARIFF REGULATIONS.

As soon as the official copy of the tariff bill reaches the department, the proper officer will be placed in charge of it, and regulations necessary to carry it into execution will be prepared and circulated.

#### IS THE TARIFF BILL CONSTITUTIONAL?

Information has been received here that some parties doubt the constitutionality of the tariff bill, and will test that point in the Supreme Court of the United States. It was remarked by a prominent practitioner before that tribunal, that there was no doubt in his mind that this law would involve endless litigation if the dissatisfied parties chose to adopt that course of resisting its provisions; but that such suits would not stay the operation of the law. In the event of a suit growing out of an alleged collection of an improper duty, the action of the court would only apply to that specific case, and on the very next importation of the same articles the Government would collect the same duty, and continue to do so until the Supreme Court decided otherwise. It is not known, however, how the constitutional issue could be made or sustained, although, as was remarked, there are two sides to the question. The bill was regularly passed, and not with any more indecent haste than a great many other measures under similar circumstances. The House waived its point of prerogative.

#### THE ONLY REMEDY.

The only hope of settling this question satisfactorily to all the people interested will be by the voice of the people themselves. The apathy which existed among manufacturing classes all over the country resulted in the election of a powerful free-trade element, and they will run the policy of the next Congress. Those who aided in passing the bill claim that they were pressed by their friends from all parts of the country not to adjourn without settling the question some way, and that the bill which was passed while not fully satisfactory, was the best that could be had. A tribunal higher than the Supreme Court—the people—can give a verdict, but to reach that it will be necessary to send people to Congress who will not talk tariff for protection on the stump, and vote tariff for revenue only on the floor of Congress.

#### The Basic Process in the South.

A correspondent writing from Tennessee says:

The one condition that will make the production of Bessemer steel in the Southern district is the application of the basic process to our metal. There is no Bessemer ore worth mentioning in the South. Small bodies are found here and there, which do pretty well, but are soon used up, or as they are worked are found to contain either too much silicon or too much phosphorus.

All the West Tennessee and Middle Alabama ores carry large percentages of silicon. The gray ore found near Cartersville, Ga., makes a pig that converts into Bessemer until the mine is worked to considerable depth, when it becomes lean and full of silicon.

This is true of all the hematite deposits of East Tennessee and Southern Kentucky. The magnetites of Western North Carolina have not been tested for Bessemer purposes, though they produce a very fine crucible steel. The Roane Iron Co. have spied out the land; every hill containing a

suggestion of Bessemer ore has been tested by their experts, until they are thoroughly satisfied there is not enough of this grade of ore in the South out of Virginia to justify any expenditure for its utilization.

The Southern furnaces are now making as

#### A CONSTITUTIONAL QUESTION.

There is some doubt as to the constitutional power of Congress to enact legislation on this subject which would be binding upon private citizens in any State or Territory and engaged in the supply of the ordinary demands of trade. For this reason the proposed prohibitory legislation is confined by the terms of the bill, as will be seen, to the employment or performance of labor, by convicts or persons restrained of their liberty, upon the public works or property of the United States; and no money shall be paid from the Treasury to any contractor or to any person on account of labor performed by any person who is under sentence or conviction for any offense by any court, tribunal, judge, justice of the peace, commissioner or other officer of the United States, or of any Territory or State, nor shall labor by any person under duress or restraint of his liberty, either before or after conviction, be performed on the expenditure of any of the public money of the United States; and no money shall be paid by any department or public officer to any contractor or person whose claim shall be founded wholly or in part, directly or indirectly, upon such labor.

There can be no question as to the power of the Government over its own expenditures for public works, but in the case of

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SUCCESSORS TO  
PROVIDENCE TOOL CO.,  
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**MACHINERY NUTS,**

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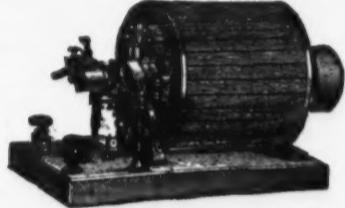
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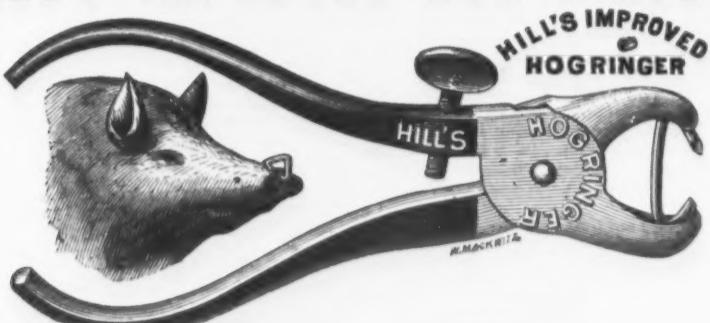
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CLOSES ALL THREE SIZES OF THE

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**White Lead, Red Lead & Litharge.**  
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**The Atlantic White Lead and  
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STEAM HEATING BY DIRECT RADIATION  
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THE ALL MINES. McCOLLUM MINES.  
BREWSTERS, Putnam Co., N. Y.

AVERAGE ANALYSIS.

Per-oxide Iron	50.59	Silica	45.10
Protoxide Iron	23.02	Carbonic Acid	
Protoxide Manganese	32	Phosphoric Acid	37
Alumina	3.27	Titanic Acid	
Magnesia	.76	Sulphur	.58
Lime	1.65	Soda	
		Water, &c.	
		Metallic Iron	53.31 %
		Metallic Manganese	.24
		Phosphorus	.16

THE CROTON MAGNETIC IRON MINES are now ready to contract for next year's delivery of their superior Magnetic Iron Ores, delivered at Port Morris, New York City or on the line of New York and New England Railroad, Erie Railroad and connections.

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For Nickel, Bronze, Brass, Copper  
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Experienced men sent to put up  
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We call attention to infringe-  
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in which Automatic Switches  
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of all forms of Automatic  
Switches for Plating Machines.  
The adoption of these ma-  
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great loss to parties purchasing  
or using them.

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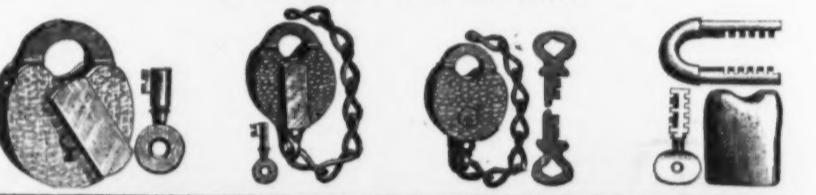
Manufactury Newark, N. J. New York Office, 92 & 94 Liberty St.

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PADLOCKS,**

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BEST QUALITY. LARGE VARIETY.

Railroad and other Padlocks made to order.



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**FEED WATER HEATERS.**

The Best and Cheapest in the  
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Warranted to heat water by exhaust steam  
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Pike Station, New Hampshire,  
Manufacturer and Wholesale Dealer in  
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Factories at Pike Station, N. H.  
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Indian Paint Rock, Etc.,  
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Chestnut, Pine,  
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Stone modelled and branded in any style de-  
sired. Price and Quality Guaranteed. All the above  
brands are of clear, keen grit, and will not glaze.

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MANUFACTURERS OF  
Bell Hangers', Telephone and Chair-  
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Agent for PHOENIX LOCK WORKS, Locks  
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TON FOUNDRY, Soft, Gray and Malleable Cast-  
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Borers; U. S. TOOL CO., Screw Drivers,  
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Phoenix Lock Works, Locks and Keys; Phoenix Gun Implement Co.; Paragon Lock Works, Jail Locks; Falls City Co., Wood Turning, all kinds; Brighton Foundry, Soft, Gray and Malleable Castings; L. J. Gaylord, Gimlet and Bung Borers; U. S. Tool Co., Screw Drivers, Acme Can Openers and Handles.

**Machinery for Forging Anchors.**

We present herewith a recent and rather ingenious improvement in the manufacture of anchors, made by Mr. John Nock of Hassken, on the Golden Horn, Constantinople. By this method the anchors are manufactured in one piece, the several limbs of the anchor being rolled into shape by a rolling apparatus especially designed for this

the anchor to their desired shape and taper, and with the required protuberances on them.

The work for anchor rolling mill is prepared in the following manner: Either a flat slab or bloom, if steel is to be used, is taken, and in this slab are punched holes of a C shape, as shown in Fig. 7; the metal is severed by oblique cuts b, taking care to provide between each hole and the next

capable of pumping 5000 gallons of water a minute. Sickle's steam steering gear, and a Providence steam windlass, made by the American Windlass Co., of Providence, R. I. She is a fine, able-looking vessel, and has an estimated capacity of 100 carloads of freight.

The hull is rather a peculiar one, as the reader will see from the following particulars: It was built by Montgomery & Howard, of

boiler and aft of aft boiler. Engine frames and keelsons of Georgia pine. Rudder of white oak, 16 inches diameter of stock. Backing and filling securely bolted with 1 1/4-inch yellow metal bolts, and hung with three sets of 4-inch braces and pintals of composition fastened with copper bolts. Sponsons extend from aft wheel-beam to stern-post, and from forward wheel-beam to where guard extends, only 20 inches outside of main hull, Sponson timbers of yellow pine and hickory; planking, yellow pine, 2 1/2 by 4 inches, well fastened, calked and smoothed. Has two masts and complete set of king-posts and rods. Hull is strapped inside of frame with diagonal iron straps, 4 inches wide and 5/8 inch thick, with belt strap extending all around vessel, 6 inches wide and 1/4 inch thick. Hull, throughout, built of the best material for the purpose, thoroughly fastened and without superior afloat.

A novelty in her construction is the absence of the conventional hog-frame.

In its place, however, and to obtain the requisite longitudinal vertical rigidity, a Howe truss-bridge frame—has been built in her hold. The upper chord of this truss, which is about 200 feet long, fore and aft, supports the deck beams, and the lower chord is bolted to each frame. Additional longitudinal strength is supplied, too, by a network of iron cross-strapping on the inside of her frame. These diagonal straps are of flat iron, 4 x 5/8, and are connected to an iron belt-plate, 6 x 1/4, which extends clear fore and aft parallel to and behind the clamp-streak. This cross-bracing runs downward to and is fastened in the floor timber heads. The interstices between her frames are filled in with white pine, navy fashion, and the joints calked, thus making her floor solid from stem to

At the beginning of the present year Mr. Rainear leased a large building at No. 35 South Twenty-third street, and placed in it all of the necessary machinery for manufacturing iron and steel wire for all purposes. The establishment is called the Keystone Wire Works, and at present it contains 16 wire blocks, with daily capacity of 3 1/2 tons of wire. Mr. Rainear intends shortly to add 24 blocks more, and his total daily capacity will then be about 8 tons of wire. The product at present is market and screw wire,

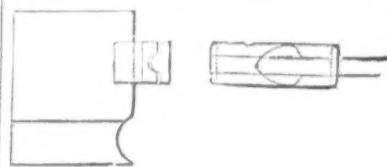


Fig. 8.—Swage for Spreading out Flukes.  
made principally from imported wire rods. Mr. Rainear says that the demand for his wire is very good.

**NEW PUBLICATIONS.**

**STORAGE OF ELECTRICITY.** By Henry Greer. Size, 5 1/2 x 8 1/2; 62 pages; illustrated. Price, paper, \$1; cloth, \$2. Published by New York Agent, College of Electrical Engineering.

This pamphlet contains a number of papers on the storage of electricity and descriptions of many of the leading storage batteries that have been proposed or used. Much of the matter has appeared in public prints, al-

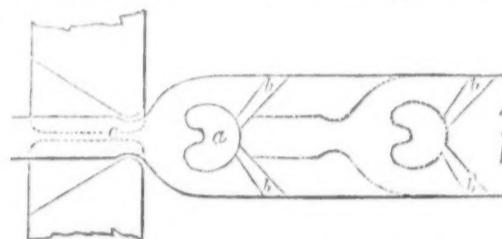


Fig. 7.—Method of Severing and Punching Slabs.

stern. Her ceiling is calked also, that her compartments, of which she has four, may be truly water-tight. She has three watertight bulkheads, the first, or the collision bulkhead, being 20 feet abaft the stem; the next one going aft, just forward of the forward boiler; the next just abaft of the after boiler. Her main deck, or freight deck, is laid in yellow pine, calked and sheathed over with 1 1/4 spruce.

When the boat was built no great speed was expected, but the performances on a few of the recent trips are rather surprising. The boat was intended to make the time from dock to dock between New York and Fall River, a distance of 181 miles, in 12 hours, when carrying a maximum load of 600 tons. On the second trip, loaded with more than 700 tons, dead weight, and carrying only 75 pounds of steam, she came through in 13 hours against a strong ebb tide. The large amount of freight was the result of a number of foggy days in the week previous, during which freight had accumulated at Fall River to an unusual extent. When it is considered that previous to her first trip the engines had never been run more than two hours consecutively, and that since she has started the engine has not had to be stopped on account of the engine itself, we think that the builders have reason to be proud. Up to the present time the bearings have not been worn on any trip yet made. The engine works very quietly and keeps its rate of 23 to 26 revolutions a minute without trouble. On the night of February 21 she made the run from dock to dock in 10 hours and 28 minutes, with a load of 400 tons. This is an average of 17 1/4 miles per hour with 75 pounds steam-pressure. On the first trip, with wheels making 24 1/2 revolutions and having a dip of 5 feet 9 inches, the engine, with 75 pounds of steam, developed 1775 horse-power. The boat was at that time making 15.2 miles per hour between Point Judith and Little Gull Island, tide ebb. Up to the present time the following are the averages of the boat:

Average time from dock to dock... 11 hours, 4 min.  
Average speed per hour..... 16.35 miles.  
Average steam pressure..... 75 pounds.  
Average load..... 415 tons net.

The tide during the time which these aver-

ages cover has been even for and against the boat.

**THE RAILROAD SPIRAL.** The Theory of the Practical and Transition Curve Reduced to Practical Formulas, &c. By Wm. H. Searles, C. E., &c. Size, 4 x 6 1/2 inches; 65 pages. Price, \$1.50. Published by John Wiley & Sons, New York.

The wear and tear caused to both permanent way and rolling stock by the abrupt

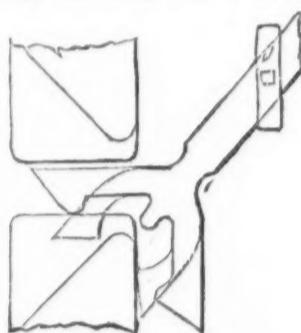


Fig. 9.—Method of Opening Out Jaws.

change in direction from a straight line to a curve has long been recognized by railroad men, and has demonstrated the usefulness of the intermediary multiform compound curve between the tangent and the circular curve. The use of the cubic parabola as such a transition curve has not met with much practical application, on account of the fancied difficulties in laying it out with transit and chain, and the amount of algebraic work supposed to be involved in its adoption. In the above little handbook, which is in convenient pocket form, the author has reduced the theory of this curve to a practical and convenient form for ordinary field work, involving no greater difficulty than the running of circular curves. The book

attaching the shank to a fixed point of the framing of the mill, so that the arm, while passing between the rolls, is made to travel in a curve. Finally the hole is made in the shank at the forge. For anchors which have their arms jointed to the shank, the same apparatus is applicable to roll the shank to shape as one piece and to roll the two arms to shape as a separate piece.

**The Steamer City of Fall River.**

Average time from dock to dock... 11 hours, 4 min.  
Average speed per hour..... 16.35 miles.  
Average steam pressure..... 75 pounds.  
Average load..... 415 tons net.

The tide during the time which these aver-

ages cover has been even for and against the boat.

**THE NEW WIRE WORKS IN PHILADELPHIA.** Since the American Iron and Steel Association compiled its list of the wire-drawers and rod mills in the United States, which was recently published in our columns, a new wire-drawing establishment has been started in Philadelphia. The works are owned by Mr. T. R. Rainear, who was formerly connected with the Philadelphia Wire Works.

forms a valuable appendix to "Field Engineering," by the same author, contains many valuable tables, and is likely to meet a hearty welcome from railroad engineers.

The five copper mines in Michigan which have declared dividends during the past year have a paid-up capital of \$2,500,000, and the dividends paid amount to \$2,900,000. The Calumet and Hecla, which has a capital of \$1,200,000, paid its stockholders in the past year \$2,000,000.

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**Special Notices.****BOOKS ON IRON, STEEL AND METALLURGY.**

*Gore.—The Art of Electro-Metallurgy.* By G. Gore; illustrated, 391 pp., 12mo, cloth; 1877 . \$2.50

Platers and gilders will find in this work a concise statement of the history and principles of electro-deposition, the general rules to be followed in actual working with all metals, and the special means of depositing nearly every known metal and metalloid.

*Overman.—Metallurgy.* By F. Overman, M. E.; 6th edition, 377 illustrations, 723 pages, 8vo, cloth; 1852 . \$5

This treatise presents a practical view of the various operations of metallurgy, with details of working, ventilating and draining mines; assaying and testing minerals; descriptions of furnaces, forge hammers, rolling mills. The preparation of ores and the classification of metals are considered in detail.

*Percy.—Manufacture of Russian Sheet Iron.* By John Percy; 12 illustrations, 23 pages, 8vo, pamphlet; 1876 . \$0.50

This little pamphlet, by a well-known English author, consists chiefly of a description of various methods of making sheet iron as practiced by Russian engineers. The information is very complete, considering the size of the work, and there is an appendix upon the manufacture of American sheet iron.

*Wylie.—Iron Founding.* By Claude Wylie, with diagrams; 164 pages, 8vo, cloth. London, 1881. . \$1.40

This treatise is a record of the extensive experience of a practical iron molder who thoroughly understands his business, and who has expressed his ideas in a manner that commands attention. With the exception of quotations from the works of Bloxam and other authors on the properties of metals, the matter of this book is in a great measure original.

*Atwood.—Practical Blow-Pipe Assaying.* By George Atwood; 74 illustrations, 210 pages, 12mo, cloth; 1881 . \$2

This book contains full descriptions of the blow-pipe, its management, and other apparatus necessary for assaying. The general system advocated is simple and practical, and directions are laid down for the determination of sixty-four elements.

*Larkin.—The Practical Brass and Iron Founder's Guide.* By James Larkin; 5th edition, revised, 301 pages, 12mo, cloth; 1866 . \$3

A concise treatise on brass founding and molding by a practical founder. The properties of metals and their alloys are discussed with special reference to their use in bell and gun founding, and in casting and manufacturing statuary, medallions and various other articles used in the industrial arts and for ornamentation. Useful recipes for tinning, jannanning and varnishing brass, iron and other metals are given, and there are brief remarks on the manufacture of iron and steel.

*Barba.—The Use of Steel.* By J. Barba; translated from the French by A. L. Holley; illustrated, 110 pages, 12 mo, cloth; 1875 . \$1.50

Treats of the composition and classification of steel for constructive purposes, with methods of working, applying and testing plates and bars.

*Byrne.—The Practical Metal Worker's Assistant.* By Oliver Byrne; revised edition, 609 illustrations, 683 pages, 8vo, cloth; 1872 . \$7

A comprehensive and complete work of instruction for metal workers, comprising metallurgic chemistry and the process of working iron, steel and all metals and alloys. Special attention is given to the best methods of forging, hardening and tempering, casting and founding, soldering, &c. The processes dependent upon ductility are explained, and there are chapters upon screw-cutting and other tools. The latter part of the book consists of the history and application of the art of electro-metallurgy to manufacturing purposes, including descriptions of galvanic batteries, and the processes of electrolytizing and electro-plating. There is also an appendix upon the manufacture of Russian sheet iron, Malleson iron castings and improvements in Bessemer steel.

Any book published will be sent, postpaid, on receipt of price. Address

**DAVID WILLIAMS,**  
Publisher and Bookseller,  
83 Reade St., NEW YORK.

**Wanted.**

Cotton Ties Name price, point of delivery.  
c.

J. J. LIPPINCOTT & CO.

131 South 4th st., Philadelphia, Pa.

**Wanted.**

A Competent man to work in the capacity of Draftsman and Chemist at a Steel Works. Please give references and salary expected, and state previous experience. Address

BOX 108,

Alliance, Ohio.

**Special Notices.****J. SEIDEL.****Commission Merchant,**

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**HABANA, CUBA,**

Will be happy to accept the representation of first-class houses manufacturing hardware.

Reference:

COLLINS & CO., 22 Water Street, New York.

**:36 INCH**

**DRILL PRESSES**

READY FOR DELIVERY.

**E. L. HARRINGTON,**

426 North 23d Street,

**PHILADELPHIA, PA.****Foundry for Sale or to Let.**

Situated in the village of Green Island, N. Y., on the opposite side of Hudson River from Troy, N. Y., on the line of N. Y. C. R. R. and R. & S. R. Dept's of D. & H. Co. tracks; within easy reach also of Hudson River and Erie and Champlain Canal. Can be reached by boat at 10 a. m. and be in New York early next morning. To manufacturers of Hardware specialties it offers exceptionally fine advantages. Has a good engine and all necessary machinery in the buildings.

Correspondence solicited. Address JAMES MORRISON, Troy, N. Y.

**For Sale.**

12 x 24 cut-off Engine, band wheel 8 ft. dia., 12 in. face. Judson governor now running. To be replaced by one of our new engines.

A. G. BROOKS & WINEBRENER,  
261 N. 3d st., Philadelphia, Pa.

**For Sale or Lease.**

A well-equipped Machine Shop and Foundry, in complete running order.

Address SUPPLEE STEAM ENGINE CO., Columbia, Pa.

**LEIGH'S DISCOUNT BOOK**

Specially arranged for the use of the HARDWARE TRADE.

Acknowledged by ALL the best work of the kind ever published. Free by mail ONE DOLLAR.

Address E. B. LEICH,  
See 'The American Brake Co., St. Louis, Mo.'

**Wanted**

To buy—A first-class steam power Boiler Riveting Machine.

Send description, price and conditions to JAMES MCNEIL & BRO., Pittsburgh, Pa.

**Wanted.**

An experienced salesman who is thoroughly acquainted with the Pig Iron Market.

Address P. O. BOX 32,  
Philadelphia, Pa.

**Wanted.**

An experienced man to superintend the manufacture of Foundry Facings.

Address W. C. C.,  
306 and 308 Aliceanna st., Baltimore, Md.

**Wanted.**

A Salesman well acquainted with the city and out-of-town copper trade.

Address COPPER 48,  
Office of The Iron Age, 53 Reade st., New York.

**Wanted.**

A Salesman well acquainted with the city and out-of-town copper trade.

Address COPPER 48,  
Office of The Iron Age, 53 Reade st., New York.

**Power Shears.**

(Second Hand).

With capacity to cut steel rails. Send full particulars, with lowest price for spot cash, to GUELPH CARRIAGE GOODS CO., Guelph, Canada.

WANTED—By a practical man, a situation as Foreman Moulder in an Iron Foundry. Has had 12 years' experience as foreman, and is thoroughly competent to take charge of a jobbing shop of any size and doing any class of work, and run it to a profit. Best reference. Address H. G. Gosher, P. O. N. Y.

HARDWARE COMMISSION HOUSE solicits specialties in the Hardware line. Would make advances on consignments.

SLOAT & QUINN, 2 Murray st., N. Y.

MANUFACTURERS seeking a desirable, high, healthy location, with unrivaled railroad facilities, correspond with

IMPROVEMENT COMMITTEE,  
New Castle, Henry County, Ind.

WANTED—An experienced Salesman who is well acquainted with the Pig Iron Market.

DE VEAUX POWELL,  
Business Manager,  
Saxton, Pa.

SITUATION WANTED, by an unmarried man, as Traveling Salesman or in Salesman in store; has had 10 years' experience in Building and Carriage Trade. Has successfully carried on a branch store; can speak German. Satisfactory reference furnished. Address J. S. K., Office of The Iron Age, 53 Reade st., New York.

MANAGER WANTED—for a small Anthracite Furnace using largely magnetic ores. A good place for a thoroughly competent man.

Address, stating age, experience, pay expected.

FERRO,  
Box 672, New York City.

SCREW PRESS FOR SALE—A large screw Press, nearly new, in fine order; screw, 34 in. diam., 16 in. between uprights, 5 in. round nose in bed; weight, about 1200 lbs. Price, \$15.

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A Competent man to work in the capacity of

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**Special Notices.****New and Second-hand Iron Working****MACHINERY.**

Two Engine Lathes, 42 in. x 16 ft. Triple Geared. Ames. New. August.

One Engine Lathe, 36 in. x 18 ft. Fifield. New. Aug. 1.

One Engine Lathe, 24 in. x 18 ft. Fifield. New. Aug. 1.

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One Engine Lathe, 24 in. x 18 ft. Fifield. New

## THE IRON AGE.

**Special Notices.**  
**BOYD'S DIRECTORY**

OF THE

**Iron, Steel, Hardware and Metal Trades,****Machinery of every description, Tools, Agricultural Implements, &c.**

Embracing all the Wholesale and Retail Dealers Manufacturers, Importers, Jobbers, Commission Merchants, Brokers and Artisans in all the Base Metals, and all goods manufactured from them throughout the United States and Canada.

Great care is being taken to make it full and complete. The information will be classified under business headings relating to the several departments of the trades, and will be arranged by States so conveniently that any city or name therein can be readily turned to.

The size of the work will be a quarto, 7½ by 10 inches, so that advertisers having large cuts may have ample room for display. It will be neatly printed and bound, and contain about 400 pages. A few pages will be devoted to those who wish to advertise their specialties.

The price of the work to subscribers is \$5, and their names inserted in capital letters.

No money collected until the work is published.

**ANDREW BOYD,**Witing Block, Syracuse, N. Y., U. S. of A.  
Publisher of City and State Directories.  
Branch office, Room 50, Tribune Building, New York.**For Sale or Lease.****A Large Two-Story Brick Factory,**

formerly Macneil Works, at Pearl River, N. Y., on railroad depot, 2½ miles from New York City. Railroad facilities unexceptionable, on the line of the New Jersey and New York Railroad. The property contains 40,000 square feet floor space, with one 80 H. P. Engine and Boiler, 700 ft. x 10 in. line shafting and pulleys, main belts, steam heating and water pipes throughout the building. A splendid foundry, 70 ft. x 10 ft., one tendency mill, 11 ft. x 10 ft., a brick office, and ample grounds for stock and tender. For further particulars address

J. E. & Co.,  
113 Liberty St., New York City,  
or Pearl River, Rockland Co., N. Y.**For Sale.**

The largest stock of New and Second-hand Engines, Boilers, and general Machinery in the West. Send for Catalogue. Hoisting Outfits for Coal Mining and other purposes a specialty.

WARREN SPRINGER,  
195 to 219 South Canal St., Chicago.**Lathes for Sale at Low Prices.**

One 30 in. x 10 ft. bed, one 17 in. x 11 ft. bed, Hewes &amp; Phillips. One 16 in. Pend and two 13 in. Lathes.

The above will be delivered in first-class order  
GEO. A. OHL & CO.,  
East Newark, N. J.**For Sale.**

Second hand

**DROPS and LIFTERS.**  
BEECHER & PECK,  
Lock Box 122, New Haven, Conn.**For Sale.**Heavy Planer, 35 in. x 13 ft., with rack extension, to plane 20 ft. Good a. new.  
Swing back Gear, self-feed, compound table—table rates and lowers by power.  
Lever Shears to cut 2 x 2.  
Lever Shears to trim ½ plate.  
A. G. BROOKS & WINEBRENER,  
261 N. 3d St., Philadelphia.**For Sale, Cheap.**New Patent Bolt-Heading Machine, made by Greenwood & Bailey, Leeds, England.  
Also valuable lot of Gun Machinery, used by the United States Government.  
Send for description of above toJOSEPH LUMLEY,  
144 North 3d st., Philadelphia.**Wanted.**

A Partner with \$5,000 to \$10,000 in a Foundry and Machine Business, established in 1882. For particulars, inquire of

I. H. COLLIER,  
Poughkeepsie, N. Y.**To Lease.**The Machinery Complete of a Plate and Sheet Mill.  
Machinery modern, ready to set up, and in good order. Address THOS. R. MCKILLIP,  
110 Dearborn St., Chicago, Ill.**IRON AND METAL Exchange Memberships**Bought and Sold by  
WM. WILLIS MERRILL,  
4 Stone Street, Room 69.  
Dealer in**EXCHANGE MEMBERSHIPS.**CORRESPONDENCE IS SOLICITED  
with parties having**MACHINERY TO BUILD,**

Heavy work preferred.

Address THE HARTFORD ENGINEERING CO.,  
Hartford, Conn.**Special Notices.****SECOND-HAND AND NEW MACHINERY.**

IN STORE Feb. 1.

One Corliss Beam Condensing Engine, 30 in. x 72 in. Two Horizontal Corliss Engines, 10 in. x 22 in. New. One Horizontal Corliss Engine, 12 in. x 30 in. New. One Horizontal Corliss Engine, 14 in. x 30 in. New. One Horizontal Engine, 12 in. x 24 in. One Horizontal Engine, 12 in. x 24 in. One Horizontal Engine, 8 in. x 12 in. One Horizontal Engine, 6 in. x 8 in.

One Planer, 36 in. x 8 ft. New. One Planer, 22 in. x 5 ft.

One Engine Lathe, 16 in. x 6 ft.

One Engine Lathe, 13 in. x 6 ft.

One Hand Lathe, 14 in. x 4 ft.

One Engine Lathe, 13 in. x 6 ft.

One 18-in. Upright Drill, Blaisdell.

One Pratt &amp; Whitney Gear Cutter.

One Wood &amp; Light Milling Machine.

One Profile Machine.

One Daniels Planing Machine.

One Davidson Pump, No. 4, New.

One Four-Particular Pump, New.

One Stump and Bower, 20 in.

One 18-foot Fly Wheel, in segments.

One Locomotive Boiler, 100 h. p.

One Horizontal Tubular Boiler, 6 in. x 15 in.

One Horizontal Tubular Boiler, 3½ in. x 14 in.

One Horizontal Tubular Boiler, 4½ in. x 13 in. New.

One Upright Boiler, 10 in. x 8 ft.

One Portable Engine, 25 H. P.

Shafting, Pulleys, Hangers, S. Vises, &amp;c.

One Horizontal Engine, 12 in. x 16 in. New.

Two Ross Paint Mills.

One No. 3 Bissell &amp; Williams Foot Press, with Dies from pints to gallons.

Four Licorice or Bark Mills.

One Tank, 30 ft. x 12 ft. x 10 ft.; 27,000 gallons.

Five Harris Paint Mills.

J. Gray's Machinery Depot, 37 Dey St., N. Y.

**For Sale.****Palo Alto Rolling Mills,**

Near Pottsville, Pa.,

ON THE MAIN LINE OF THE POTTSVILLE

AND READING RAILROAD.

These mills are in good repair, and can be started in two days' time.

Rolls for T-Rails 12 to 75 lbs per yard, and for Steel Rails 10 to 75 lbs per yard.

Grade Mill Tools for Merchant Iron ½ to 1 inch.

Rolls for Merchant Bar, round and square, up to ½ inches.

Number of Puddling Furnaces in both mills, 30; Heating Furnaces, 9; all with boilers attached.

Also Foundry, Machine Shop, Blacksmith Shops, Iron House, Roll House, Carpenter and Painter Shops, Stables, handsome Dwelling for Superintendent, n. 1, Tenement Houses, a Brick Office, and ample grounds for stock and tender.

For further particulars address

Messrs. LEE &amp; McCAMANT, Extrs.,

Pottsville, Pa.

THOS. F. WRIGHT, 1804 Race St., Philadelphia, Pa.

HUGH W. ADAMS, 56 Pine St., New York.

**Bargains.**

One Engine Lathe, 22 in. x 17 ft. Second hand.

One Engine Lathe, 30 in. x 17 ft. 6 in. Bement.

One Engine Lathe, 24 in. x 16 ft. Bement.

One Engine Lathe, 24 in. x 12 ft. Perkins, New.

One Engine Lathe, 22 in. x 10 ft. Perkins, New.

One Engine Lathe, 19 in. x 10 ft. Pond.

One Engine Lathe, 18 in. x 9 ft. Perkins, New.

One Engine Lathe, 16 in. x 6 ft. Perkins, New.

One American Tool Square Arbor Fox Lathe.

One Planer, 54 x 16. White.

One Planer, 31 x 9. New Haven.

One Planer, 35 x 7. New Haven.

One 36-in. Drill.

One 25-in. Drill. Prentiss, New.

One 20-in. Drill. Prentiss, New.

One No. 2 Lincoln Pattern Miller.

Four Hand Lathes.

One Pulley Boring Machine.

Engines and Boilers, all sizes.

**LOVEGROVE & CO.,**

152 N. Third St., Philadelphia.

**For Sale.**

The Industrial Works of Shamokin, owned and successfully carried on for a number of years by the late Wm. Brown, deceased, consisting of Foundry, Machine Shop, Lathe, and Lathes, and other fixtures regarded as part of the property. Boiler Shop, Blacksmith Shop and Factory for the manufacture of heavy coal screens. Well located in the borough of Shamokin, Pa., with the best facilities for shipping by rail, and surrounded by a district contributing all the work that a shop of that kind can possibly turn out. The works are now running, but in a very short time possession can be given. Easy terms of payment are offered to suit a purchaser of limited capital.

Offered for sale by WM. McILVAINE &amp; SONS, Reading, Pa.

**For Sale.**

MACHINES FOR MAKING PICKS, MATTOCKS AND AXES.

T. &amp; CO., Box 25.

Office of The Iron Age, 81 Reade St., New York.

**For Sale.**

No. 6 Sturtevant Blower and Countershaft.

One Blake Steam Pump, Goo as new.

Nos. 3, 4 and 5 Philia. Hydraulic Works &amp; Steam Pumps.

Belt Pump for Hydraulic Press.

1-inch Head &amp; Nisco Centrifugal Pump.

Small Steam Blowing Engine.

A. G. BROOKS &amp; WINEBRENER,

261 N. 3d St., Philadelphia.

**For Sale.**

Manufacturing Property for Sale.

The Real Estate of the late Foundry and Machine Company of Taunton, Mass. Buildings consist of Foundry, Machine, Erecting and Blacksmith Shops, and covering about 60,000 square feet of ground. For particulars apply to

THE GEORGE PLACE MACHINERY AGENCY,

121 Chambers St., New York.

**For Sale.**

To a competent Mechanical Engineer, with experience in managing Machine shops, at interest in the Omaha Foundry &amp; Machine Co., at Omaha, Neb. The largest and best equipped shops in Nebraska, with a splendid trade and no local competition. Address

T. W. T. RICHARDS,

Omaha, Neb.

NEW MACHINE TOOLS, &amp;c.

27 in. x 26 in. Planer, planes 7 ft., with chuck, \$62.

15 in. x 6 ft. Engine Lathe, rod and screw, with power, cross feed and 6 in. chuck, \$50.

20 in. swing Upright Drill, latest design, \$175.

The tools are complete—about w/lat 16,000 nuts per hour—\$200.

AMERICAN TOOL CO.,

CLEVELAND, OHIO.

**Trade Report.****BRITISH IRON AND METAL MARKETS.**

[Special Cable Dispatch to the Iron Age.]

LONDON, WEDNESDAY, March 14, 1883.

**Scotch Pig.**—The market is quiet and prices steady. Business during the week has been good. Warrants are quoted 47/8. Makers' prices are quoted as follows:

Coltress, alongside, Glasgow..... 65/

Langloan, " " " 65/

Gartsherrie, " " " 65/

Summerlee, " " " 65/

Carnbroe, " " " 50/

Glengarnock, " Ardrossan..... 55/6

Eglinton, " " " 50/

Dalmellington, " " " 50/6

Shotts, at Leith..... 50/6

Lighterage from Ardrossan to Glasgow is 1/2 ton.

Makers' prices are quoted as follows:

Coltress, alongside, Glasgow..... 65/

Langloan, " " " 65/

Gartsherrie, " " " 65/&lt;/



exceedingly unsatisfactory all around. Quotations are nominally about 2.3¢ for Refined Iron, but buyers of large lots can doubtless place their orders at better figures, according to quantity and specification. Common Iron can be had at 2¢, but there is not much demand. Skelp Iron has been in moderate request, and several sales have been made at something like 2.2¢ @ 2.25¢ at mill.

**Plate and Tank Iron.**—The market does not improve as manufacturers would like to see it, and business during the week has been very disappointing. There are no Tank orders on the market of any account, and prospects are not encouraging as regards that department. Bridge-work is likely to develop about the usual amount of work, and the shipyards will probably require a good deal of material, but there is no immediate prospect of anything like an active demand; hence the weakness in prices. Bridge Plate, Boat Plate and Tank Iron are quoted at 2.5¢, but for large orders prices would be shaded, while 2.55¢ @ 2.6¢ is asked for small lots.

**Structural Iron.**—There is only a moderate demand, and many of the mills are running very close on their orders. A reduction was made on Channels, as was noticed in our last quotations, and the combination have made further arrangements by which it is believed that imports will be prevented. Buyers of lots of 200,000 lb. and upward will be entitled to discounts, to be named on sending in their specifications. Quotations remain as before: 2.5¢ for Angles, 3.2¢ for Tees, and 3.5¢ for Beams and Channels.

**Sheet Iron.**—The demand is fair and sales have been on the basis of last quotations, namely, for small lots:

Common Sheets, No. 28.....	4.5¢
Common Sheets, Nos. 26 and 27.....	4.5¢
Common Sheets, No. 25.....	4.5¢
Common Sheets, No. 16 to 21.....	3.5¢
Best Refined 1/2" advance on the above.....	4.5¢
Best Bloom Sheets, No. 22 to 25.....	3.5¢
Best Bloom Sheets, No. 16 to 21.....	3.5¢
Common Red Plates, 3-1/2" to 16".....	3.15¢
Blue Annexed, 3-1/2" to 16".....	3.35¢
Best Bloom, Galvanized, discount.....	3.5¢
Second quality, discount.....	4.5¢

**Wrought Iron Pipe.**—The market is somewhat steadier than a week ago, and under a slightly increased demand. We quote discounts on Boiler Tubes 55¢ and Steam Pipe 67½¢ @ 70% off price list. There appears to be less disposition to shade these figures than a short time ago.

**Old Rails.**—Nominal at \$25 @ \$25.50 for T's; small lots in demand.

**Scrap Iron.**—Cargo lots, \$25.50 @ \$26; selected yard lots, \$27 @ \$27.50.

**Nails.**—Have been in better demand, but any great improvement can hardly be looked for, considering the state of the weather. Prices are still irregular, and sales are made freely at \$3.50, with further concessions on desirable orders.

**Bessemer Pig.**—There seems to be no disposition to buy, and prices are purely nominal at about \$22 @ \$22.50. Buyers intimate that they expect to place orders at \$21 below the asking rates.

**Spiegleisen.**—A sale of 1000 tons of 20% Spiegel was made at \$32 f.o.b. cars Baltimore; also a 500-ton lot at a sterling price, New York.

**Crop Ends.**—Sales have been made of lots aggregating about 1000 tons at \$21 @ \$21.25, f.o.b. cars at mill. Foreign of certain makes are wanted for shipment at about \$22.

Messrs. Blakely & Walbaum, of this city, have opened a branch office at Nos. 55 and 57 Pine street, New York. The increasing business of this firm renders such a step not only a convenience, but a matter of necessity. They will, as in Philadelphia, make a specialty of metals, iron ores and railroad supplies generally.

Edward Samuel & Co., of Philadelphia, selling agents of the Co-operative Iron and Steel Works, announce that they have lately erected a Siemens-Martin plant, together with a plate train, all of the most modern and approved construction, and are prepared to make steel plates for bridges, boilers, tanks, ships and all other uses, guaranteed to such tests as may be required. Their special brand and trade-mark will be "Cheops."

**EASTERN PIG IRON ASSOCIATION.**

PHILADELPHIA, March 12, 1883.

To the Editor of *The Iron Age*.—DEAR SIR: A meeting is hereby called of this association for Friday next, 16th inst., at 12 o'clock, noon, at the Mercantile Club, No. 234 South Third street, Philadelphia, for the purpose of hearing the report of the Committee on Permanent Organization, and for action on such other matters as may be brought before the meeting.

Any firm, corporation or individual manufacturing pig iron for sale in the open market, not represented at the preliminary meeting held in New York January 5th, 1883, is cordially invited to attend.

Respectfully,

HENRY T. ECKERT, Chairman.  
J. WESLEY PULLMAN, Secretary.  
Committee on Permanent Organization.

#### PITTSBURGH.

(Special Dispatch to *The Iron Age*.)

PITTSBURGH, March 14, 1883.

The regular monthly meeting of the Western Nail Association was held to-day, and was very fully attended, representatives from all parts of the West being present. Statistics showed that the stocks at mills were exceedingly low, and assortments all broken. It is stated that a majority of the mills could not assort an order for a carload, and that there is not a mill in the West that could supply an assorted order of a thousand kegs at once. The mills are almost out of sizes less than twelve. The association unanimously agreed to begin operations at the factories next Monday, and run three weeks, or up to and including April 7; then stop two weeks. No change was made in the card.

Office of *The Iron Age*, 77 Fourth Avenue, Pittsburg, Pa., March 13, 1883.

While there has been no material improvement in the general Iron business as yet, a much better feeling has been developed dur-

ing the past week, and the opinion generally obtains that a decidedly better trade is near at hand. There has been considerable inquiry within the past few days. Some of the mills are reported as being fully employed, and the indications are that they will soon be working up to their full capacity. In the Ohio and Mississippi valleys people have commenced to recover from the effects of the recent disastrous floods, and the crop reports from nearly all parts of the West and South are more encouraging. Moreover, the tariff agitation being out of the way, people are better prepared to make some calculation in regard to the future. No one expects a boom, nor is it desired, but there is no good reason apparent at present why there should not be a good, healthy business this spring, not only in Iron, but in all kinds of Pittsburgh manufactures. It is worthy of mention that, owing to the largely increased railroad facilities, trade is becoming more equalized; jobbers and large consumers, instead of anticipating future wants, as used to be the custom—ordering about twice a year, spring and fall—are now ordering mainly as their immediate wants require, and it is not necessary for them, as in former years, to carry large stocks.

**Ores.**—Furnacemen who need Ore at all are buying only as their immediate necessities require, and they say that this will be their policy this year unless there is a very decided change in the Pig Iron market. Many of them are at present using Ore contracted for almost a year ago at a price much higher than that now current for the same Ores. No definite price has as yet been fixed by the Ore companies, but the supposition is that it will be \$8 @ \$8.50, delivered on the dock at Cleveland.

**Pig Iron.**—The market shows an improvement since our previous report. Quotations, as a rule, remain unchanged.

Southern Coke Irons have advanced 50¢ @ \$1 1/2 ton. Scotch Imported remains unchanged at \$31 @ \$31.50, with but little inquiry.

We quote Charcoal Pig, Nos. 1 and 2, \$24; No. 3, \$25, and Nos. 4, 5 and 6, \$26.50, 4 months; Briar Hill, \$25; Silvery Soft, \$23 @ \$24; Crane No. 1, \$27.50; No. 2, \$26.50; Hinrod, \$24; Thomas, \$27.50 @ \$28; American Scotch, 24 @ \$25; Du Val, No. 1, \$24; No. 2, \$23; Fulton Notch, No. 2, \$22.50; No. 3, \$21.50. Imported Scotch, \$31 1/2 ton, cash. Southern Coke \$25.50. Calumet, \$23 @ \$23.50, 4 months.

**Manufactured Iron.**—The stocks of Merchant Iron in dealers' hands, owing to the increased demand during the past week, have been considerably reduced, so that the quantity of some of the commoner sizes on hand is small. Quotations remain firm and without any change. We quote: Bar Iron, 2.30¢ @ 2.40¢ rates; Angle Iron, 3.10¢ @ 3.30¢ rates; T Iron, 4¢ rates; Beams, 3.80¢; Channels, 3¢; Tank Iron, 3¢ @ 3.20¢ rates; Sheet Iron, 3.20¢ @ 3.40¢ rates; Norway Original Bars, 4.5¢ rates; Norway Re-rolled Bars, 5.5¢ rates; Ulster, 4.5¢ rates; Low Moor Iron, 8¢ rates; Nuts and Washers, 8¢ off list; Wrought Boat Spikes, 3 1/2¢ rates.

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**Hardware.**—The inquiry for General Hardware continues good, and quotations remain unchanged.

**Nails.**—Nails are in good request, with fair stocks in dealers' hands. We quote rod, to 6d, \$2.40 @ \$3.50 1/2 kg, with the usual discount for cash.

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production and the necessity for restriction, but nobody is willing to begin the process or to immolate himself for the good of his fellows. Voluntary restriction throughout the country is therefore scarcely possible. If the make be reduced, it will be by the operation of that hard-and-fast rule which ordains the survival of the fittest—*alias* in this case the most wealthy. The little men must suffer and go to the wall, because neither their capital nor their skill is equal to the resistance of hard times. Failures will thin the ranks of the good men and true who cannot withstand the pinch of low prices, and the weeding out will be gradual. At present we have hardly arrived at the point necessary to produce these stoppages, but we are obviously gravitating in that direction, and shall reach the goal unless by some lucky chance a revival of the demand should set in. At the time of writing the outlook does not show any signs of such a revival, so that the ordinary British ironmaster is beginning to make up his mind for a "squeeze."

## SOME CURRENT DIVIDENDS

seen to show that the results of last year's working were not wholly bad, and the reports of various companies bear testimony as to the largeness of the turnover. Palmer's Shipbuilding and Iron Co., of Jarrow, pay an interim dividend of 3½ per cent. for the half-year ending December 31, 1882; Samuel Fox & Co., Limited, Sheffield, pay an interim dividend of £4 per share (4 per cent.) for the same half-year; the Wigan Coal and Iron Co., Limited, made a net profit of £23,978, yielding a dividend of 2½ per cent. for the half-year; Vickers, Sons & Co., Limited, Sheffield, pay at the rate of 10 per cent. per annum, besides a bonus of 3½ per cent.; the Mersey Forge Co. pay at the rate of 5 per cent. per annum; the Clay Lane Iron Co. (formerly Thomas Vaughan & Co.), pay at the rate of 5 per cent. per annum, allow 7½ per cent. for depreciation and carry forward £7000 to next account.

## YOUR TARIFF DEBATES

are still being followed with great interest—a feeling not by any means devoid of anxiety in many quarters, seeing that the sudden defection of your support is universally recognized as being a prime cause of the prevalent dullness. The daily papers give us particulars each morning of the curious doings of your Senate and House, but the cross purposes of these two bodies have been so well played that the average British newspaper reader must be hopelessly mixed up in his endeavors to distinguish "either from which." Those who have followed the discussions more methodically and regularly are pretty well agreed that there is small prospect of any reductions likely to benefit the American export trade of Great Britain, in which view they are a rarely supported by the latest news from Washington. It is plainly seen that the whole business is mainly a question of log-rolling or filibustering, and so long as the issues raised are to be settled in either of these ways, so long will the wealthy protectionist element retain command of your fiscal system. I believe there is an impression in the States that all our manufacturers earnestly wish that you should adopt free trade. That is not the case, as I have previously pointed out. The smelters and a few other classes of iron and steel men undoubtedly desire your abandonment of protectionism, but the sentiments of many other persons were well expressed the other evening during a discussion at the Society of Arts rooms by an implement manufacturer, who said he was afraid your people would shortly adopt free trade.

## FORTHCOMING EXHIBITIONS.

Exhibitions as a means of stimulating and extending business are evidently yet regarded with marked favor, judging from the number of such displays arranged for the coming spring, summe, &c. Among them will be those at Madrid, Amsterdam, Berlin, Lisbon, London, Zurich, Boston (Mass.), Vienna and Calcutta. That at Amsterdam will be very large and important, as also will be the Hygienic and Sanitary Exhibition at Berlin. The Madrid show will be interesting to all metallurgists, while that at Lisbon will be wholly agricultural. The London engineering, &c., exhibition will be large and varied, while the Vienna affair will be devoted to electricity. The Calcutta one will not open until next December, prior to which Mr. Joubert, its promoter, will visit the United States. In 1884 a great national exhibition will take place at Turin, and the next or succeeding year one will be held at Rome. The gigantic "international" affairs appear to be quite—and properly—played out in this country.

## STEEL MAKING IN 1882.

I have just received a summary of the statistics of the British Iron Trade Association for 1882, showing the make, &c., of different kinds of steel in that year. The total production of Bessemer steel ingots in the United Kingdom is stated at 1,073,649 tons, an increase of 231,930 tons on the production of the previous year. Seventy-four per cent. of the ingots made were manufactured into Bessemer steel rails, against 70 per cent. in 1881 and 1880, the production of rails being 1,235,785 tons, an increase of 212,045 tons on that of 1881. The largest quantities of ingots were turned out in South Wales and Sheffield. The number of Bessemer converters at work during the year was 80, two less than in 1881, the average output per converter having increased from 17,552 tons to 20,920 tons. In 1879 the average yield per converter was only 12,641 tons. The best result obtained during 1882 was a make of 78,202, with two converters. The make of "open-hearth" steel was 436,000 tons, against 338,000 tons in 1881. Scotland is the chief seat of this industry, the production of the Scotch open-hearth works having been more than doubled during 1882, as compared with that of the previous year. On January 1, 1883, there were 1,082,457 tons of steel, iron and wooden shipping in process of construction, or about to be built, in the United Kingdom, 182,116 tons less than on January 1, 1882. If my memory serves me I think the foregoing figures show that we have once more gained the lead in Bessemer working, with an output for 1882 considerably ahead of that of the United States.

**SCOTCH PIG IRON**

has been "dead as ditch water" during the week, the range of warrants very well demonstrating the utter lack of animation in the open market, thus: 19th, 47/8 @ 47 6½; 20th, 47/7 @ 47 3½; 21st, 47 4 @ 47 3½; 22d, 47 4 @ 47 5½, and 23d, 47 6 @ 47 3½. In makers' brands there have been few changes, and those mostly in a downward direction. Virtually, however, named brands are unaltered. There are now 112 furnaces at work in Scotland, as against 108 a year ago. In Connal's stores there are 503,273 tons (a decrease last week of 2101 tons), against 631,145 tons this date 1882, and 637,526 tons at midsummer last. Shipments to date are 4093 tons ahead of those for the same period of 1882, or a total this year of 46,191 tons foreign and 72,721 tons coastwise. The imports into Scotland from Middlesboro' to date have been 29,356 tons, or 18,324 tons below those of 1882. At some of the Scotch furnaces a grade of iron is being made to compete with Cleveland pig. It is called "No. 4," and is priced as under at present: Summerlee, 55/-; Chapelhall, 55/-; Quarter, 47/6; Monkland, 47/6; Eglington, 49/-; Dalmellington, 49/6; Kinnel, 50/-, all free alongside ship. Writing from Glasgow on February 24, James Watson & Co. said: "The Scotch iron market has been flat during the past week, and the amount of business continues very restricted. The demand for shipping brands is quiet, but quotations remain steady. The Middlesboro' market is again weaker, makers having accepted as low as 40/- for No. 3, and the shipments so far this month show a heavy decrease. The warrant market here opened last Monday at 47/8 and receded to 47 6½ yesterday. On Tuesday a small business was done from 47/7 to 47 4½, cash. On Wednesday the market was depressed, with transactions from 47 4½ to 47 1½, rallying in the afternoon to 47 3½ 1½ ton. Yesterday the price further improved from 47/4 to 47 5½, relapsing to-day from 47/6 to 47/3 and closing buyers at the latter figure, sellers near. The shipments last week were 8887 tons, as compared with 10,933 tons for the corresponding week of last year." We quote:

No. 1.	No. 3.
G. M. B., at Glasgow.....	49/-
Clyde.....	59/-
Clyman.....	55/-
Gairloch.....	55/6
Summerlee.....	53/-
Calder.....	62/5
Carrbroe.....	50/-
Glenarknock, at Ardrossan.....	55/6
Eglington.....	49/-
Dalmellington.....	50/6
Shotts, at Leth.....	65/-
Kinnel, at Boness.....	48 6
Carron, at Grangemouth.....	50/-

**SCOTCH FINISHED IRON,**  
with extras, is quoted as under, f.o.b. Glasgow, less merchants' commission and usual discount for cash:

N. B.	Glasgow.	crown.	Govan.
Birs.....	26 10/-	25 10/-	26 10/-
Hoops.....	7 10/-	—	—
Sail rods.....	6 10/-	—	—
Boiler plates.....	7 10/-	7 10/-	7 10/-
Ship plates.....	7 15/-	—	—
Bars of other brands are quoted at £5 10/-.	—	—	—
Extras.—Flat, Half-Round, Oval and Half-Oval, Per ton.	—	—	—
Round, Square and Octagon,	—	—	—
3½ in. to 3½ in. 10/-	7-15 in. ....	5 to 10/-	—
4 in. ....	—	10/- to 20/-	—
4½ in. ....	—	10/- to 20/-	—
5 in. ....	—	10/- to 20/-	—
5½ in. ....	—	10/- to 20/-	—
6 in. ....	—	10/- to 20/-	—
7½ in. ....	—	10/- to 20/-	—
8½ in. ....	—	10/- to 20/-	—
9½ in. ....	—	10/- to 20/-	—
10½ in. ....	—	10/- to 20/-	—
11½ in. ....	—	10/- to 20/-	—
12½ in. ....	—	10/- to 20/-	—
13½ in. ....	—	10/- to 20/-	—
14½ in. ....	—	10/- to 20/-	—
15½ in. ....	—	10/- to 20/-	—
16½ in. ....	—	10/- to 20/-	—
17½ in. ....	—	10/- to 20/-	—
18½ in. ....	—	10/- to 20/-	—
19½ in. ....	—	10/- to 20/-	—
20½ in. ....	—	10/- to 20/-	—
MIDDLEBRO' PIG IRON	—	—	—

is steadily falling away in value—so much so indeed, that it is a difficult matter to state the actual minimum price of the day. For No. 3 foundry, 40/- has been accepted by second holders, although makers quote 41/- and assert that they will not follow the "bears" further. The demand is indifferent, and the shipping returns show a marked falling off, while stocks are again increasing. For G. M. B., f.o.b. at makers' wharves in the Tees, net cash, less 2½% discount, current quotations are:

No. 1 Foundry.....	45/-	Mottled.....	39/6
" "	43/-	White.....	39/-
" "	41/-	Refined Metal.....	50/6
" "	40/6	Kentledge.....	41/6
4 Forge.....	40/-	Cinder.....	35/-

Finishing iron is clearly weaker, ship plates being £6 2 6, and angles at £5 10/- at the works, less 2½%. Bolekow, Vaughan & Co. continue very busy indeed at their Eston Steel Works.

**HEMATITE PIG IRON**

rules dull, without quotable change in the recently obtaining low quotations. For mixed parcels makers ask 52/- @ 53/-, but lots of Nos. 1, 2 and 3, in usual proportions, have been sold at 50/- by holders anxious to realize. The demand is devoid of backbone, and there seems little likelihood of any marked alteration coming about in the near future. Makers' prices of West Coast brands are:

No. 1.	No. 2.	No. 3.
Cleator.....	57 0	57 0
Lonsdale.....	57 0	57 0
Workington.....	53 0	53 0
West Cumberland.....	—	—
Lowther.....	53 0	52 6
Moss Bay.....	—	—
Dinstington.....	53 0	52 6
Harrington.....	54/-	53/-
Solway.....	53 0	52 6
Maryport.....	53 0	52 6

Large buyers could readily shade these rates. There are now 59 (of 82) furnaces at work, making about 32,450 tons weekly. Last week's shipments included 7401 tons of pig iron and 4261 tons of steel rails. North of England hematite and Bessemer pigs, f.o.b. Cumberland ports, &c., are quoted:

Ordinary.	Bessemer.
No. 1.....	54 0
" 2.....	53 0
No. 3.....	52 0
No. 4. Foundry.....	53 0
No. 4. Forge.....	52 6
Mottled.....	52 6
White.....	52 6

Of Scotch hematites I have no quotations at present—indeed, very little of it comes into

sale. The special brand (K. H.) made by the Wigan Coal and Iron Co. meets with a good sale for particular purposes at higher than the above rates. Of South Wales and Forest of Dean hematites two or three brands are sold in the South Staffordshire, &c., markets, particularly Tredgar and Cinderford. For ferromanganese in casks there is a limited demand from your side, and for spiegelstein also—the latter at £4.76 @ £4.10/ for 15% @ 20%.

## FREIGHTS

are irregular and cannot be quoted with confidence at the moment. Very few shipments are being made to your side. I quote pig iron, Glasgow to New York, by ordinary steamers, 5/6 @ 7/; Liverpool to New York, 4/ @ 6/; Liverpool to Philadelphia, 6/ @ 7/; London to New York, for scrap, &c., 9/ @ 9/6, and others as under:

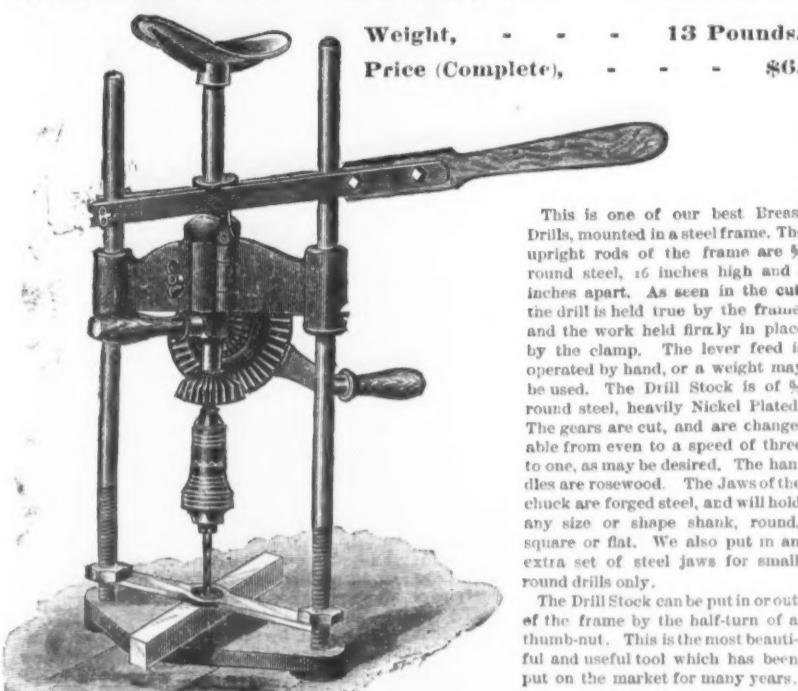
Steam.	Wales.	Steam.
New York.....	5/6	5/6 @ 7/
Philadelphia.....	6/	6/ @ 6/
Baltimore.....	6/	6/ @ 6/
Boston.....	6/	6/ @ 6/
Montreal, f.o.w.....	12/	12/ @ 12/
Galveston Wharf.....	6/	6/ @ 6/
Galveston Bay.....	6/	6/ @ 6/
New Orleans.....	11/6 @ 12/	13/6 @ 6/
San Francisco.....	6/	6/ @ 6/

## THE IRON AGE.

(Moniteur des Intérêts Matériels)

PARIS, Feb. 25, 1883.—**Metals.**—There is a gradual return to confidence causing business to revive a little. Metals have, however, still remained quite dull, and all we except Lead, which is better, have given way slightly. We quote toward the close: Copper, 167.50 @ 171.25; Ingots and Slabs, 176.25; Bars Selected, 179, and pure Corocoro, 171.25. Tin—Banca, 34.25; Billiton, 35.75; Stra

## MOUNTED BREAST DRILL.



Weight, - - - 13 Pounds.  
Price (Complete), - - - \$6.

This is one of our best Breast Drills, mounted in a steel frame. The upright rods of the frame are  $\frac{3}{4}$  round steel, 16 inches high and 3 inches apart. As seen in the cut, the drill is held true by the frame, and the work held firmly in place by the clamp. The lever feed is operated by hand, or a weight may be used. The Drill Stock is of  $\frac{3}{4}$  round steel, heavily Nickel Plated. The gears are cut, and are changeable from even to a speed of three to one, as may be desired. The handles are rosewood. The Jaws of the chuck are forged steel, and will hold any size or shape shank, round, square or flat. We also put in an extra set of steel jaws for small round drills only.

The Drill Stock can be put in or out of the frame by the half-turn of a thumb-nut. This is the most beautiful and useful tool which has been put on the market for many years.

**MILLERS FALLS COMPANY,**  
74 Chambers Street, New York.

## CHAMPLAIN

Forged Horse Nails.

MANUFACTURED BY THE

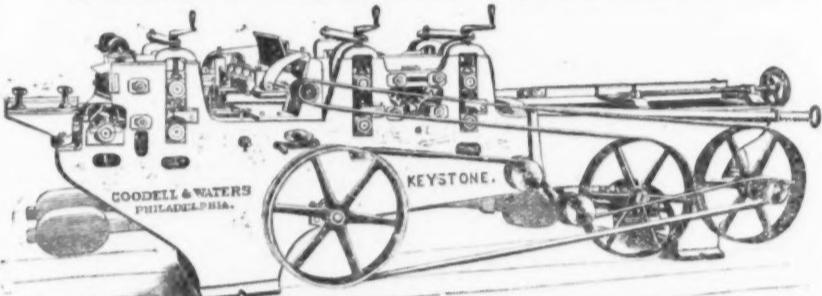
**NATIONAL HORSE NAIL CO.,**  
Vergennes, Vermont.

HOT FORGED AND COLD HAMMERED POINTED, MADE OF BEST NORWAY IRON AND WARRANTED.

WAREHOUSE

97 CHAMBERS AND 81 READE STREETS, NEW YORK.  
DURRIE & McCARTY, Sole Agents.

## WOOD-WORKING MACHINERY.

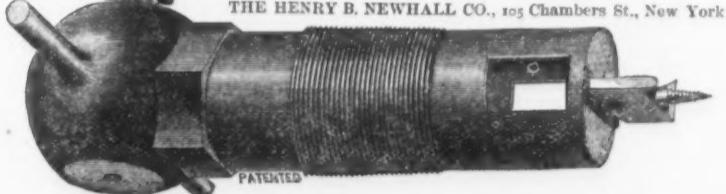


Keystone Rapid Feeding Flooreer. Machinery for Planing Mills, Railroad Shops, Car Builders, Cabinet, Carriage, Sash, Door and Blind Makers.

SEND FOR NEW CATALOGUE.  
**GOODELL & WATERS,**  
31st and Chestnut Streets, PHILADELPHIA, PA.

**NORTH BROTHERS,**  
23d & Race Sts., PHILADELPHIA, PA.;  
HARDWARE MANUFACTURERS.

LIGHT CASTINGS A SPECIALTY.  
THE HENRY B. NEWHALL CO., 105 Chambers St., New York Agents.



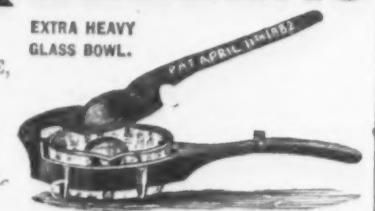
SOLE MANUFACTURERS OF THE  
"WEED IMPROVED" BORING FAUCET,  
For Molasses, Oil, Japan, Varnish, &c.

UNQUESTIONABLY THE BEST  
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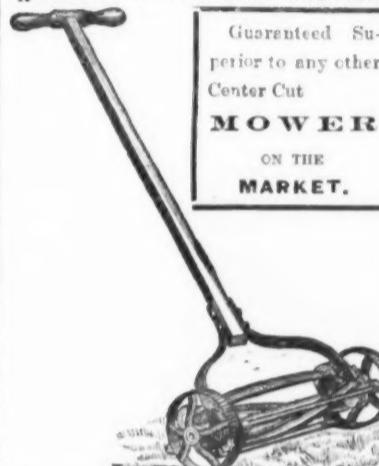
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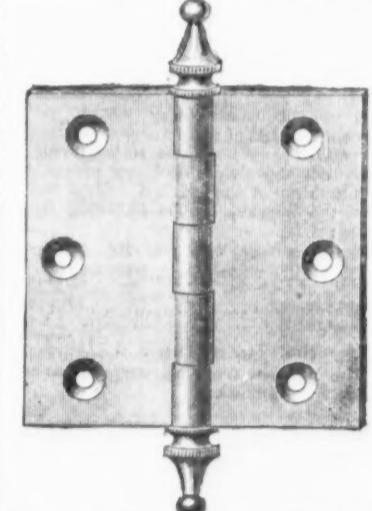
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## New Spinning Lathes.

In the manufacture of sheet-metal goods it has been found that much time can be saved in the production of cheap hollow or seamless ware, especially when made of tin plate if the articles are first drawn to shape in a press and afterward finished in a lathe. The work of the lathe, therefore, is smoothing out the "body wrinkles" that are always formed in drawing work of this kind, and finishing the edges. The Ferracute Machine Co., of Bridgeton, N. J., have recently perfected a new spinning lathe, with trimming and wiring attachments, and which they claim embraces the latest improvements in machines of its kind. It is illustrated in Fig. 1 of the accompanying engravings, while Fig. 2 shows extra parts that can be obtained according to requirements. The frame is a lid and heavy, with rounded corners, and supports a live head and a puppet on dead head, as in ordinary lathes. It also carries the special appurtenances for spinning, trimming or wiring the work. The usual shelf projecting from the bed to hold the rests is dispensed with in this machine, ample space being provided for the rests on the bed by throwing the spindle back of the center. This gives an unbroken outline to the frame, which greatly adds to the appearance, and

dimensions of this tool are as follows: Extreme length of bed, 52 inches; circle that will swing over bed, 24 inches; circle that will swing over rest and within trimming cutters, 21 inches. The speed of the lathe spindle varies from 150 to 500 revolutions per minute. The total weight of the machine is about 1400 pounds. A larger size of the same device is made, weighing 3500 pounds, and swings 32 inches over the rests.

## The Relative Corrosion of Iron and Steel.

At a recent meeting of the Paris Academy of Sciences, M. Gruner read a paper describing some researches concerning the relative corrosion of cast iron, steel and soft iron. In his experiments M. Gruner suspended various plates in a frame by their four corners, and immersed them simultaneously in water acidulated with about 5 per cent. of sulphuric acid or sea water, or simply exposed them in moist air. It was found that in the latter case chrome steels were corroded very rapidly, while tungsten steels were affected less than carbon steels. Cast iron, even with manganese, was oxidized less than steel and soft iron, and white specular iron less than gray cast iron. Sea water, on the other hand, was found to at-

tract traces of fires were to be seen on the sides thereof, and fragments of charcoal and wood in the debris, indicating the use of fire in assisting the action of wedges and in extracting the masses of copper. The melting point of copper is about 130° C., which no doubt fused the small points of copper attached to the larger masses, which the quick perception of these aboriginal people noticed, and led them to utilize in casting. The artistic forms of copper implements, whether cast or hammered, cannot fail to impress the observer that a race of men existed in early times whose origin is enveloped in mystery, and whose skill rivals that of man of historic times, assisted by all the inventions of this mighty age of iron. Professor Lewis remarked that much the greater number of prehistoric copper hammers were evidently produced by hammering. He believed that archaeologists had generally adopted the opinion that the mound-builders were not an extinct people, but were the ancestors of existing tribes.

## The Canadian Canal System.

According to the annual report of the Minister of Railways and Canals, says a Canadian contemporary, the River St. Lawrence, with the system of canals established on its course above Montreal, and the lakes Ontario, Erie, St. Clair, Huron and Superior, with connecting canals, affords a course of water communication extending from the Straits of Bell Isle to Duluth, at the head of Lake Superior, a distance of 2384 miles. This is one of the longest stretches of inland navigation in the world. Should the proposed canal between Duluth and the Red River be made—and the Duluth people seem to be in earnest in the matter—it would give us unbroken communication by water with the Red River, Lake Winnipeg and the Saskatchewan and other rivers that have their sources at the foot hills of the Rocky Mountains. The aggregate length of the canals between Montreal and Lake Erie is over 70 miles, and the difference in elevation between Three Rivers, where tidal influence ceases, and Lake Superior, is about 600 feet. The canal system, as we at present have it, was commenced in 1841. Before that time the old Durham boats were in use, though many people, in going to the West, avoided the water altogether and took to the all-cause route. In order to overcome all obstacles to the navigation of the St. Lawrence the first steps were taken by the Imperial authorities, and the prosecution of the work afterward became part of the duty of the Canadian Government. We find that, since the beginning of this work, the following amounts, omitting cents, have been expended:

Lachine Canal.....	\$8,163,718
Beaubarnois Canal.....	1,624,532
Cornwall Canal.....	2,922,519
St. Lawrence Canals.....	110,821
Williamsburgh Canals.....	1,320,512
Chain vessel, &c.....	34,643
Surveys, &c.....	142,733
Wells.....	20,309,203
St. Anne's Locks.....	539,823
Carillon and Grenville Canals.....	8,885,553
Culbute Locks.....	318,577
Rideau Canal.....	4,132,070
Champlain Canal.....	613,745
St. Peter's Canal.....	585,747
Surrey Bank Verte Canal.....	9,992

Thee items amount to a total of about \$43,418,600. This represents a considerable portion of the public debt of the country, thereby showing that our money has been largely spent on works of value to the people, works without which we could not have well carried on our inter-provincial trade. It was originally thought that the receipts from canal tolls and the use of water-power would go far toward the cost of maintenance. These expectations have not been realized, for we find that the simple ordinary expenses, to say nothing of the original outlay, far exceed the income, as the following figures show:

Construction during fiscal year 1852.....	\$1,634,781.67
Repairs during fiscal year.....	207,770.71
Maintenance during fiscal year.....	235,120.00

Total expenses.....	\$8,075,676.47
Receipts.....	326,340.71

Expenditure over receipts.....	\$1,750,315.76
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The receipts from all our sources were made up as follows:

Tolls.....	\$110,144.07
St. Lawrence Canals.....	100,023.00
Chambly Canal.....	24,023.20
Ottawa Canals.....	58,495.05
Rideau Canal.....	6,136.70
Burlington Bay Canal.....	3,537.00
Newcastle District Works.....	311.68
St. Peter's Canal.....	910.74

Total.....	\$304,014.71
Hydraulic rents.....	32,326.31

Grand total.....	\$326,340.71
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Thus, while our canals last year cost us over \$2,000,000, they gave us in return only \$326,340. In the face of those figures it may well be asked, Why should we continue to levy tolls? The amount that we draw therefrom is but a trifle, as compared with the entire revenue of the Dominion. But, aside from this, it must be borne in mind that we have now to compete with the free canals of the State of New York for the carrying trade of the West. Montreal should have the bulk of that trade. Situated as it is, at the head of navigation and at the foot of inland navigation, we should control the traffic between the West and the sea. The natural channel to the ocean runs past our doors, while through New York the channel is an artificial one, and much more costly and inconvenient than ours. Then why not sweep away the tolls at once, and have done with them? The revenue is nothing, as compared with the benefits that would follow the freeing of our canals. Not Montreal alone, but the whole of the western portion of the Dominion are interested in this important matter. It is to be hoped, therefore, that the Government will, before long, remove the tolls, and thus assist in bringing the trade of the West down the St. Lawrence.

The new steamer *Advance*, built for the United States and Brazil Steamship Co., has arrived in this city from the yards of Messrs. John Roach & Sons. The *Advance* is the second new vessel built for this line, and resembles the first one, the *Finance*, in every particular. Her dimensions are: Length,

317 feet; breadth, 38 feet 4 inches; depth of hold, 23 feet. She has a net tonnage of 1910 tons, or 2600 gross tons, and is supplied with every requisite for speed, safety and comfort in the shape of electric bells, steam-heaters and the most improved life-saving apparatus. She will be under the command of Captain Beers, who has been long on the route between here and Rio Janeiro. The *Advance* will make her first trip from this port Saturday next.

## The Origin of the Steam Hammer.

Under the above head an English contemporary gives the following interesting account of the steam hammer:

Patricroft is the birthplace of the steam hammer, the invention of which marked the commencement of a new era in mechanical progress. The hammers previously in use were those called "tilt" or "helve" hammers, and these were worked either by steam, water or hand power. Helve hammers are even now in existence in some forges. The larger the object operated upon by such hammers, the lighter is the blow that is dealt, and conversely, the smaller the object the heavier the blow. The difficulty which presented itself to the mind of Mr. Nasmyth, of forging large masses of iron with such an imperfect tool, led to his invention of the "direct-action steam-hammer," which has played no unimportant part in the mechanical progress of this generation. It was in the early part of the year 1837 that the directors of the Great Western Steamship Company sent Mr. Francis Humphries, their engineer, to consult Mr. Nasmyth as to some engineering tools of unusual size and power, which were required for the construction of the engines of the steamship *Great Britain*. They had determined to construct those engines on the vertical trunk-engine principle, in accordance with Mr. Humphries' designs, and very complete works were erected by them at their Bristol dock-yard for the execution of the requisite machinery, the most important of the tools being supplied by Messrs. Nasmyth, Gaskell & Co. The engines were in hand when a difficulty arose with respect to the enormous paddle-shaft of the vessel, which was of such a size of forging as had never before been executed. Mr. Humphries applied to the largest engineering firms throughout the country for tenders of the price at which they would execute this part of the work, but, to his surprise and dismay, he found that not one of the firms he applied to would undertake so large a forging. In his dilemma he wrote to Mr. Nasmyth on the 24th of November, 1838, informing him of this unlooked-for difficulty. "I find," said he, "there is not a forge-hammer in England or Scotland powerful enough to forge the paddle-shaft of the engine for the *Great Britain*. What am I to do? Do you think I may dare to use cast iron?"

This letter immediately set Mr. Nasmyth thinking. How was it that existing hammers were incapable of forging wrought-iron shafts of 30 inches diameter? Simply because of their want of compass, or range and fall, as well as power of blow. A few moments' rapid thought satisfied him that it was by rigidly adhering to the old traditional form of hand-hammer—which of the "tilt," though driven by steam, was but a modification—that the difficulty had arisen. When even the largest hammer was tilted up to its full height, its range was so small that when a piece of work of considerable size was placed on the anvil the hammer became "gagged," and on such an occasion, where the forging required the most powerful blow, it received next to no blow at all, the clear space for fall being almost entirely occupied by the work on the anvil. The obvious remedy was to invent some method by which a block of iron should be lifted to a sufficient height above the object on which it was desired to strike a blow, and let the block fall down upon the work—guiding it in its descent by such simple means as should give the required precision in the percussive action of the falling mass.

Following out this idea, Mr. Nasmyth at once sketched on paper his steam-hammer, having it clearly before his mind's eye a few minutes after receiving Mr. Humphries' letter narrating his unlooked-for difficulty, and by the same day's post the sketch of the invention by which Mr. Nasmyth proposed to forge the *Great Britain* paddle-shaft was sent to him, and he showed it to Mr. Brunel, the engineer-in-chief of the company, and to others, by all of whom it was heartily approved. The paddle-shaft was, however, never forged for the *Great Britain*. About that time the substitution of the screw for the paddle-wheel as a means of propulsion of steam vessels was attracting much attention, and the performances of the Archimedes were so successful as to induce Mr. Brunel to recommend his directors to adopt the new power. The great engines which Mr. Humphries had designed were accordingly set aside, so neither his great paddle-shaft nor Mr. Nasmyth's steam-hammer to forge it was any longer needed by him. In passing, we note that Mr. Wilson, who eventually played so important a part in the development of the steam-hammer, was the first to bring out the screw propeller in a practical form, namely, in 1825.

The hammer was left to bide its time until an opening for its utilization should appear. When in France, in April, 1840, and passing through the iron works at Creuzot, with M. Bourdon, the practical mechanician there, Mr. Nasmyth saw a crank axle of unusual size. He immediately asked, "How did you forge that shaft?" M. Bourdon's answer was, "Why, with your hammer, to be sure!" Great, indeed, was Mr. Nasmyth's surprise, for he had never yet seen the hammer, except in his own drawing. A little explanation soon cleared all up. Mr. Gaskell (Mr. Nasmyth's partner) had on a visit of M. Bourdon and Schneider to Patricroft, while he was away, shown, as an act of courtesy, Mr. Nasmyth's sketch of the hammer, and had considered the matter too trivial to be mentioned to him. M. Bourdon said he had been so much struck with the ingenuity and simplicity of the arrangement, that he had no sooner returned than he had a hammer made in general accordance with the design Mr. Gaskell

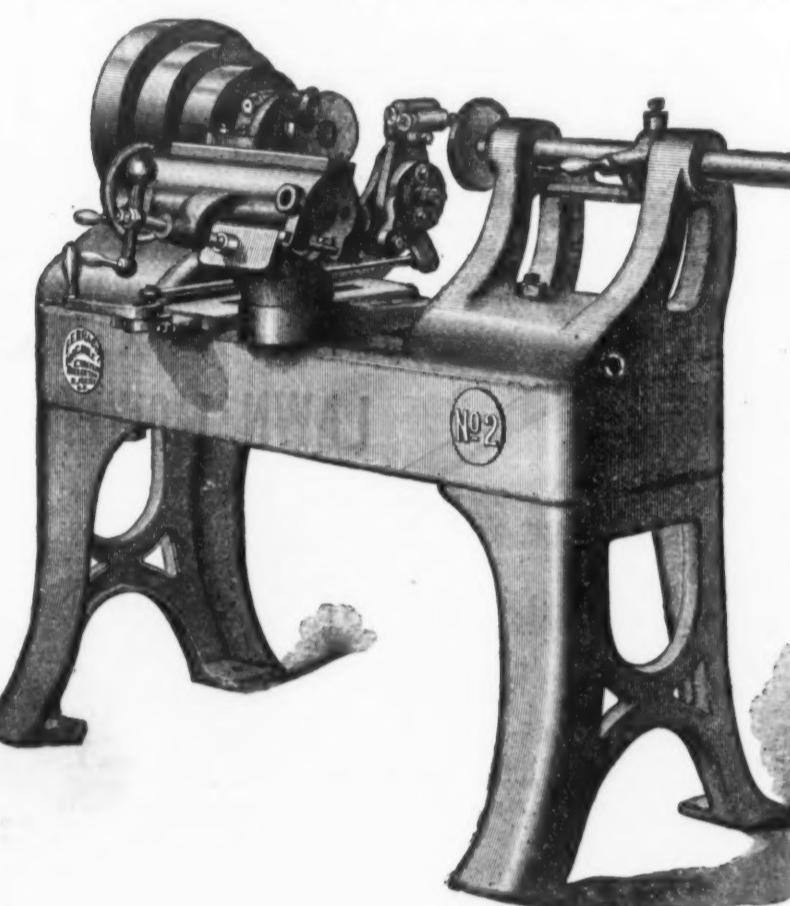
had shown him, and that its performance had answered his every expectation. Mr. Nasmyth was taken to see the hammer, and great was his delight to see the child of his brain in full and active work. He applied for patent on January 9, 1842, which was enrolled on December 9, the same year. It was about six months after the patent was secured, namely, at the end of 1842 or the beginning of 1843, when his first hammer was finished. It was hammer of 30 cwt, falling weight, and was made for the Patricroft works. From the moment it commenced to work, the steam hammer became a recognized power in modern mechanics.

James Watt took out a patent, April 28, 1784, for "heavy hammers or stampers, for forging or stamping iron, copper or other metals, or other matters, without the intervention of rotation motions or wheels, by fixing the hammer or stamper to be so worked either directly to the piston or piston-rod of the engine;" and Mr. W. Deverell also took out a patent, June 6, 1806, in which he says: "This invention consists in giving motion to hammers, and various other contrivances for stamping," &c., and then he proceeds to state he "first causes steam to be raised in a boiler or steam vessel, as in the common way, having a steam cylinder with a piston and piston-rod in it, at the end of which is a hammer, either made fast to the rod by welding, or in any other proper way; the steam from the boiler or steam vessel, as aforesaid, is let in underneath the piston by means of an opening cock or valve, or cocks or valves; the air at the top of the piston will then be compressed by the superior pressure of the steam underneath the piston; after the piston has been raised to a given height there will be an opening made from the under side of the piston and a vacuum formed, as in the common way, or otherwise the steam may be let out into the common air. The compressed air on the top of the piston will then force down the hammer with velocity equal to what it may be compressed."

Both these specifications unmistakably shadow forth the direct-action steam-hammer, but neither Watt nor Deverell appear to have carried their ideas on the subject into practical operation. Although these specifications existed, it is indisputable that Mr. Nasmyth's form of hammer was his own invention, and since the expiration of his patent, in 1856, a host of firms have adopted principles embodied in his make of hammer. The field for the usefulness of the steam-hammer, as at first put into practical form, was not large. It was then only applicable for massive forgings, the demand for which was then rare. In order that the idea of a hammer worked by the direct action of steam might be extended to the manufacture of all ranges of forging, from the smallest to the greatest, it was necessary that it should be workable at high speed and be self-acting. Nasmyth's first type of hammer had a valve motion which could only be worked by hand, and that with much labor. The utility of the machine was therefore much restricted. The conditions to be fulfilled by a self-acting apparatus were, that the height to which the hammer would rise should be capable of adjustment, in order to have complete command over the power of the blow, and that the instant the blow was struck the hammer should again rise, so that not only loss of time should ensue, but that the heat in the mass of iron on the anvil might not be reduced nor carried off by the cold face of the hammer.

The peculiar difficulty of insuring a true automatic arrangement will be seen when it is considered that the instant of percussion must vary with almost every blow that is struck, for the piece on the anvil becomes thinner and thinner by each succeeding blow, and in flat bars a blow is first given on the flat side and then on the edge, the difference in the fall of the hammer in the two cases being oftentimes several inches; and, further, that the hammer must be under perfect control at all times. Mr. Wilson, the manager for Mr. Nasmyth, solved the problem in 1843. He invented a self-acting motion by the application of which hammers could be made capable of forging an Armstrong gun, or cracking a nut without breaking the kernel, and he under such complete control that while the top was descending with its greatest momentum, it could be arrested at any point with even greater ease than any instrument used by hand. The steam hammer was further improved by Mr. Wilson by the introduction in July, 1856, of his patent "balanced slide-valve," and in June, 1861, by his patent "double-acting hand-gear motion." By these steam can be admitted to the under side of the piston only, and so work single-acting, and be admitted to the top side of the piston also, when sharper or more powerful blows are required, and change from single to double action, and vice versa, can be effected instantaneously and in the simplest manner, and the height of fall—and, therefore, force of blow—varied as required by the attendant at the handle by which the balanced slide-valve is moved. In May, 1862, Mr. Wilson designed and erected a small steam-hammer specially for working small steel, which requires a great speed. The hammer block was of wrought iron, and weighed, with the piston-rod, about 2 cwt. The hammer was fitted with the balanced valve, double-acting and with an entirely new self-acting motion, much simpler and less complicated than the original one, capable of striking 500 blows per minute with a precision and certainty of action truly astonishing. Although there are now in existence many able and ingenious makers of steam-hammers, including some on the Continent, all have learned something of the steam-hammer from the inventions of Messrs. Nasmyth & Wilson.

The latest English journals speak of "a great steel-rail order" just received by a shielded house from the Government of New South Wales, the quantity being 72,000 tons. The house referred to is understood to be that of Charles Cammell & Co. The price is stated at £5 per ton, free on board, and as deliveries are extended over four and one-half years, the quotation, though it looks low, is quite equal to what is being generally obtained at present, especially when the quantity is taken into consideration. The precise weight is said to be 72,605 tons of steel flange rails, 71½ pounds per yard.



New Spinning Lathes.—Fig. 1.—New Lathe, with Spinning, Trimming and Wiring Rests, Built by the Ferracute Machine Co., Bridgeton, N. J.

at the same time to simplicity of construction. The live head has a revolving steel spindle with a cone pulley upon it, and a screw thread and shoulder to receive the various chucks. This spindle is driven from a countershaft, which fastens to the ceiling above. The dead head has a sliding spindle with several holding disks, and a locking device to clamp the article to be spun against the live chuck. The spinning apparatus consists of a special slide-rest carrying a roller tool. The upper portion of it is arranged to revolve about a vertical stud in its

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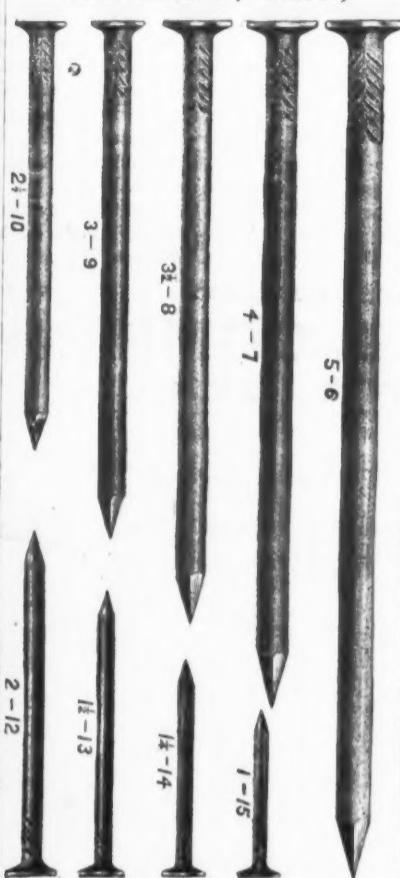
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- Meier Iron Co., Ill.
- North Chicago Steel Co., Ill.
- Union Foundry Co., Ill.
- Means & Culbertson, Ky.
- Ashland Furnace Co., Ky.
- Norton Iron Co., Ky.
- Brown Iron Co., I. and S. Co., Tenn.
- Seawater Furnace Co., Tenn.
- James C. Warner, Rising Sun, Md.
- Ohio Iron Co., Zanesville, O.
- Bloss Furnace Co., Ala.

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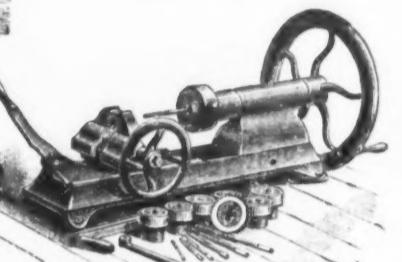
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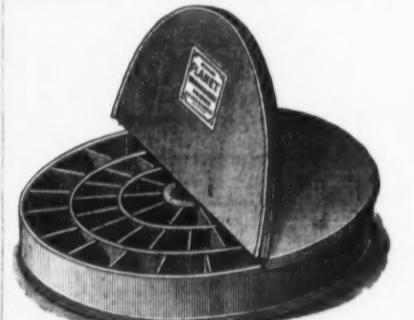
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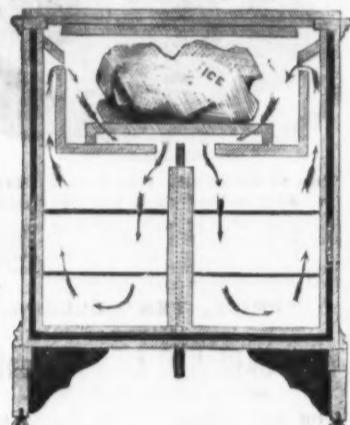
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## A New Secondary Battery.

Secondary batteries are now rapidly multiplying in number, and among recent inventions in that direction we would mention a new form of battery proposed by Messrs. Liardet and Donnithorne, of London, England. The main features of the appliance, as stated by the inventors, are the intermixing of porous lead, deposited either by direct action by means of a galvanic current, or by the action of spelter with oxides and salts of lead, such as may be produced from galena or other lead ore, as the acting substance of the plates, to accumulate the current. This mixture is placed on very thin plates of pure lead, which serve as conductors, and is kept in position by porous plates. Great stress is laid upon the purity of the lead and lead compounds, as by this means the inventors seek to avoid local action and to increase the intensity and durability of the battery. An experimental set of cells recently tested consisted of 50 elements, each of which had an area of one-twelfth of a square foot, the weight of the set being 315 pounds. The cells, having been charged with a dynamo, are reported to have given a current of 12 amperes with an electro motive force of 95 volts. The inventors claim that they have produced a secondary battery or accumulator of half the weight, half the cost and nearly twice the power of any other.

The other day we received from an extensive manufacturing concern a catalogue, the modesty of which astonished us, for the artist had conformed to show on the last page an establishment with a frontage of 200 feet, an L 300 feet long on the side, and a furnace building of reasonable size beyond. How he managed to make them appear so nearly of a reasonable size we are unable to say, for we have noticed that whenever an establishment gets up a picture of this kind the artist usually spreads himself, so to speak, and gives us the impression that the buildings cover at least one county and hang over into some of those adjoining. Indeed, we call to mind several concerns having from three to five 18 x 20 shops, which the engravers have made to cover a territory nearly as large as the State of Connecticut. We certainly never before saw in a picture any works so small as in the catalogue referred to, and we submit that the firm in question ought to call in the edition and have a new cut made, or send out another cut to be pasted over the old one, in which the works should be properly expanded in appearance so as to cover the whole State. Just now, however, it occurs to us that possibly the size of the works on the ground and the size of the works in the picture bear an inverse ratio to each other. If this is the case the matter is explained, but it had never occurred to us before in just this light.

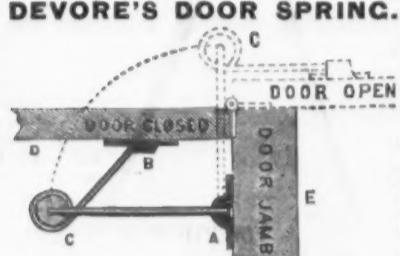


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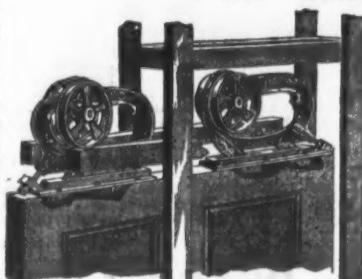
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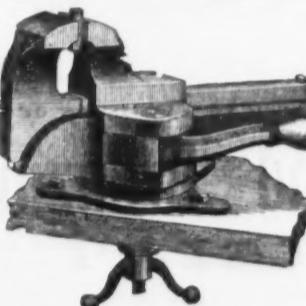
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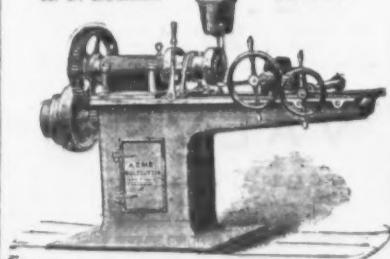


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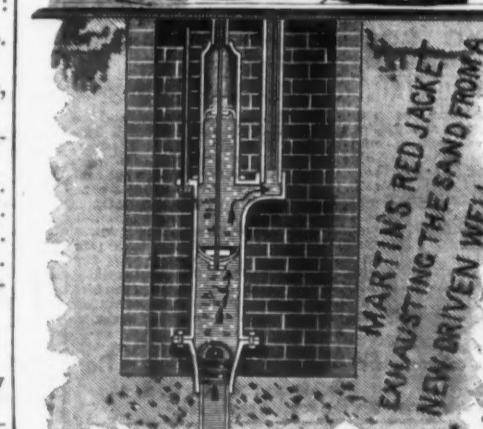
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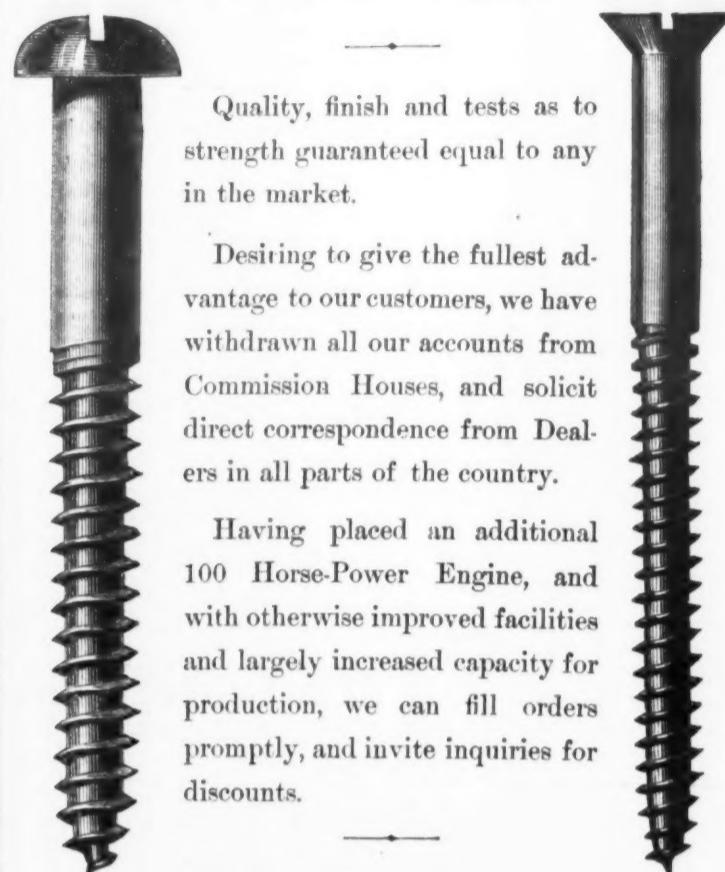
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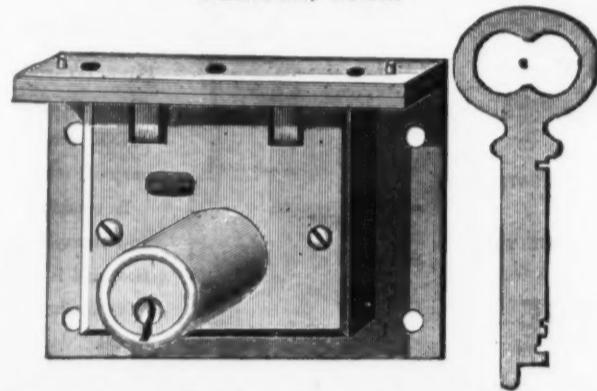
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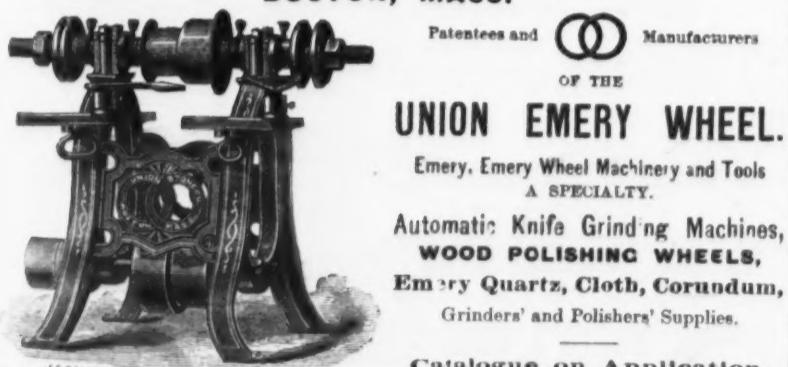
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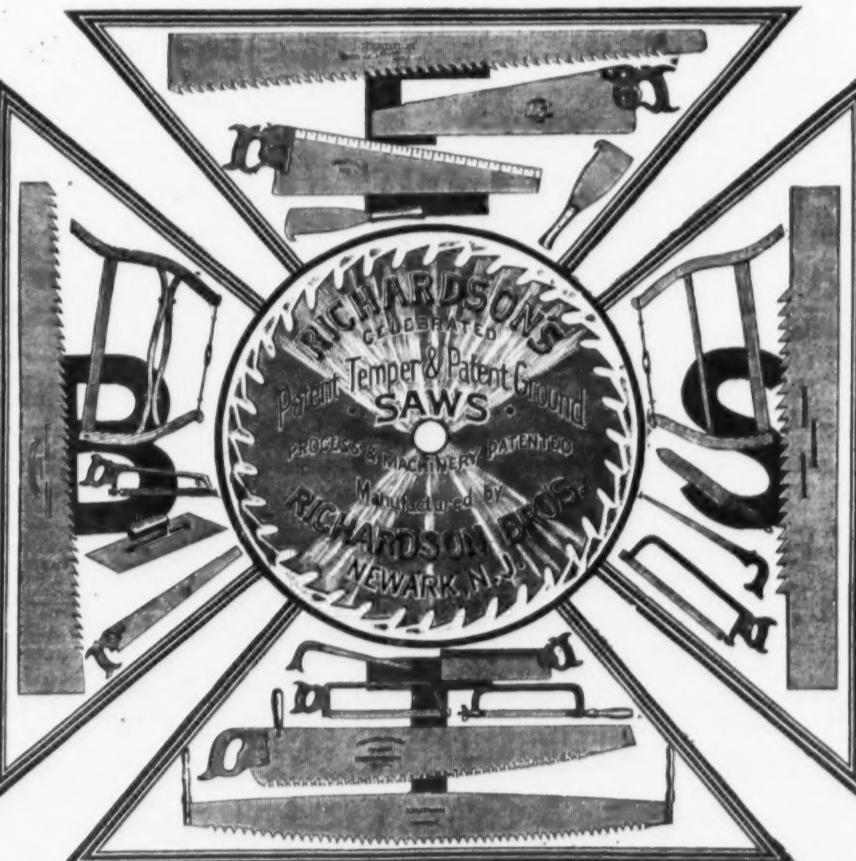
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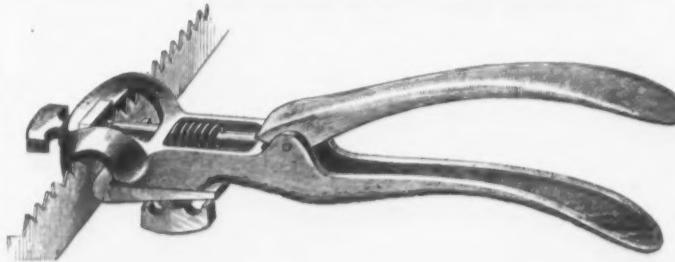
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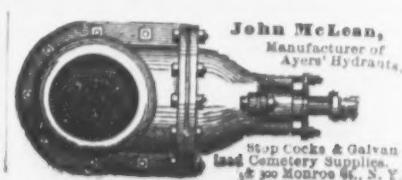


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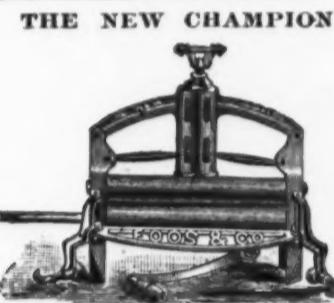
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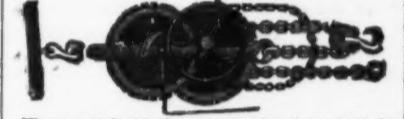
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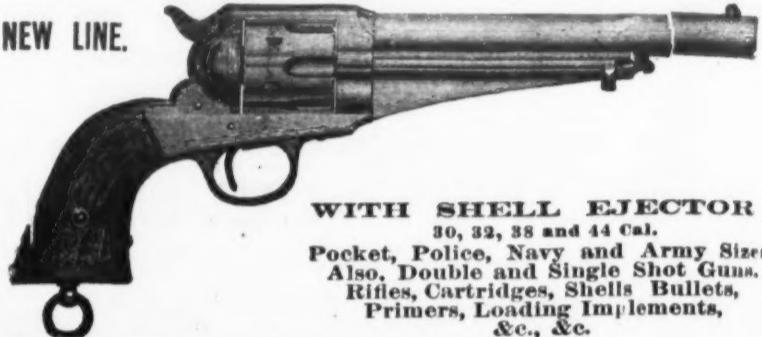
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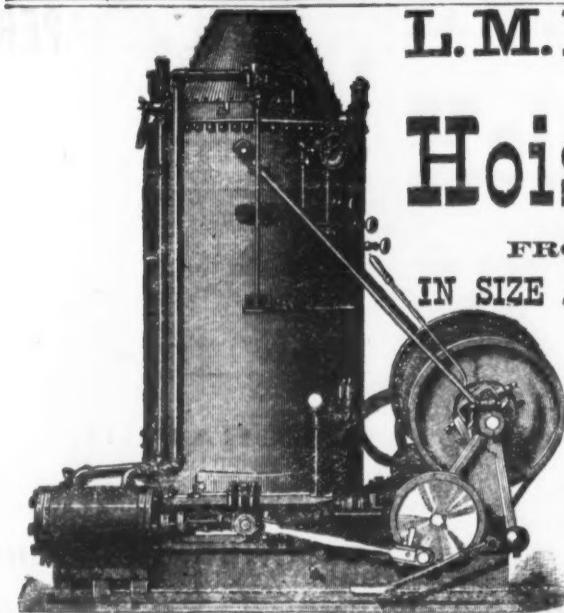
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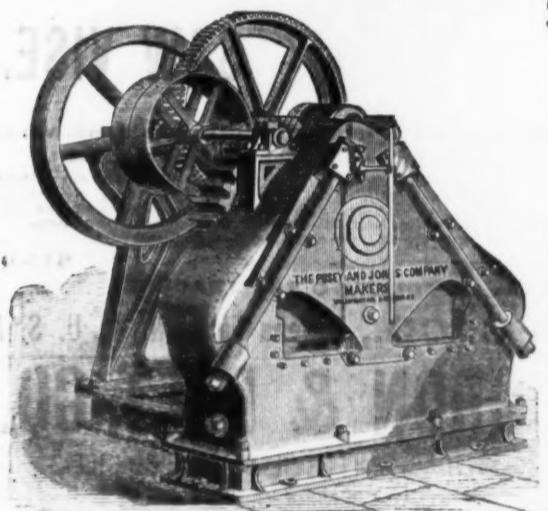
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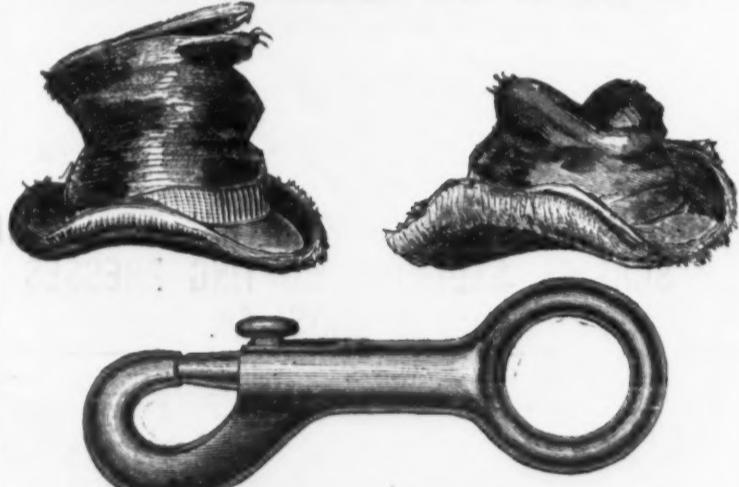
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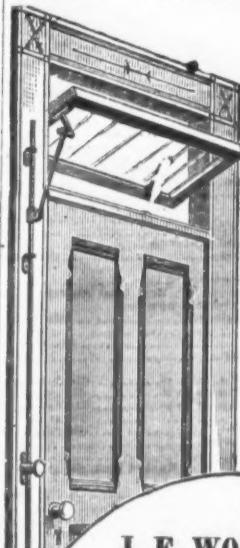
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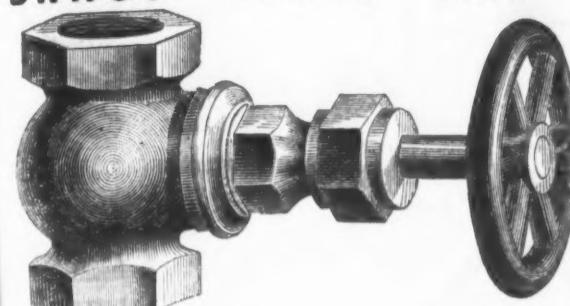
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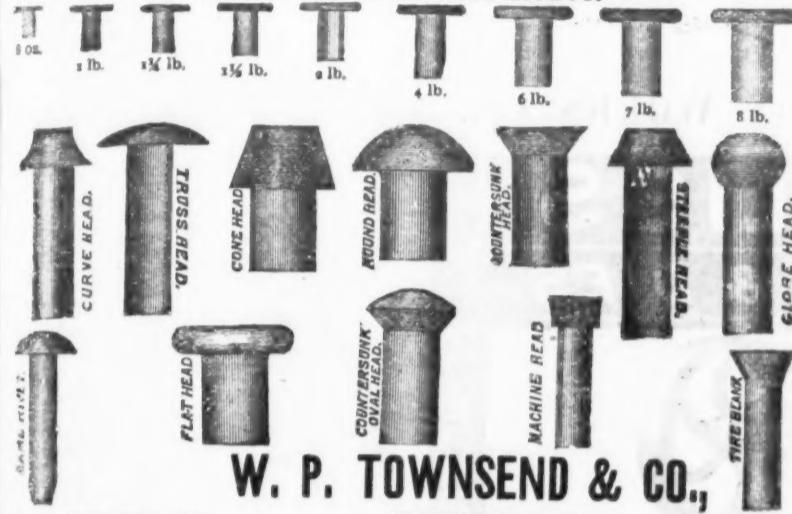
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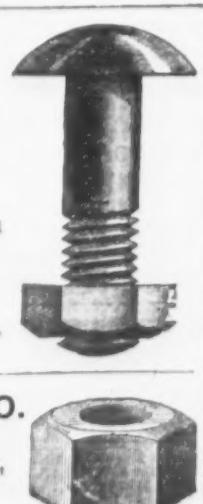
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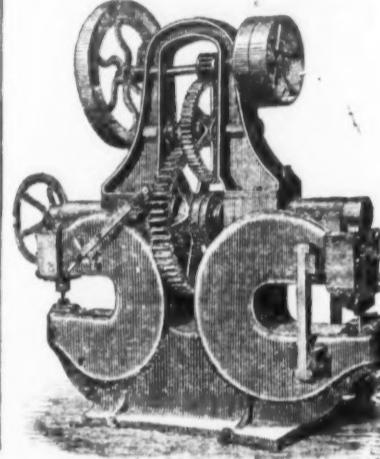
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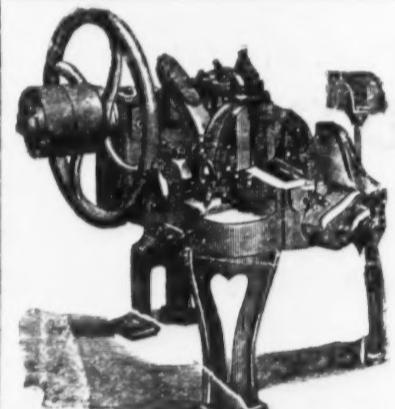
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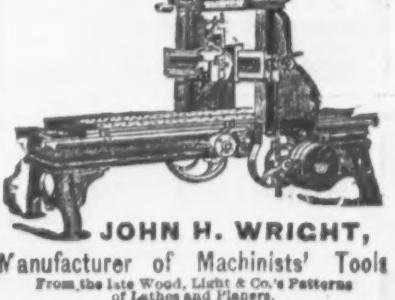
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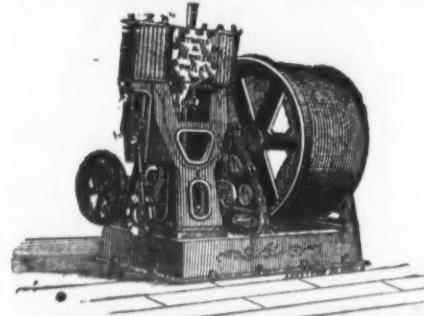
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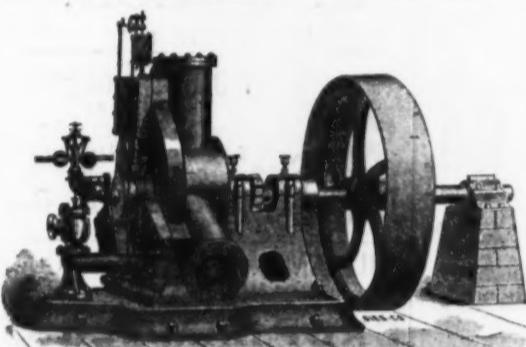
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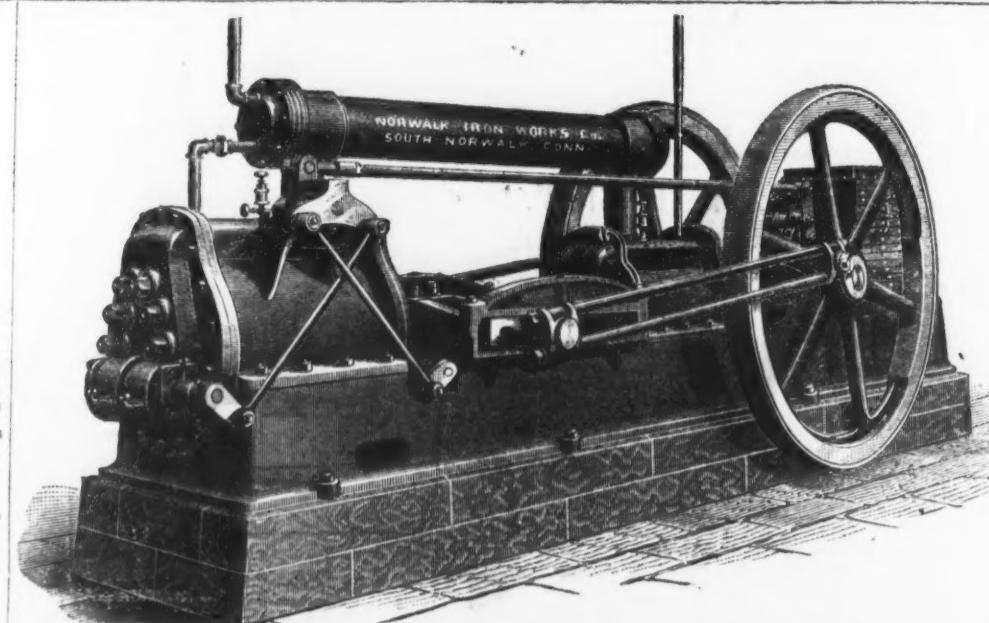
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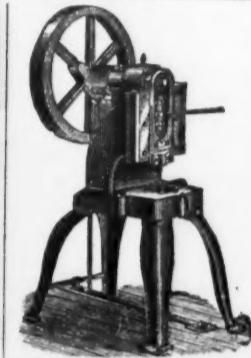
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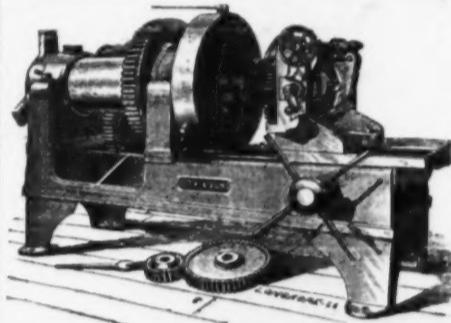
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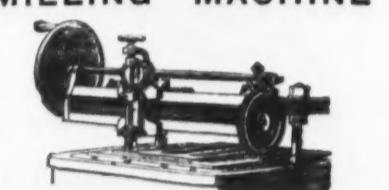
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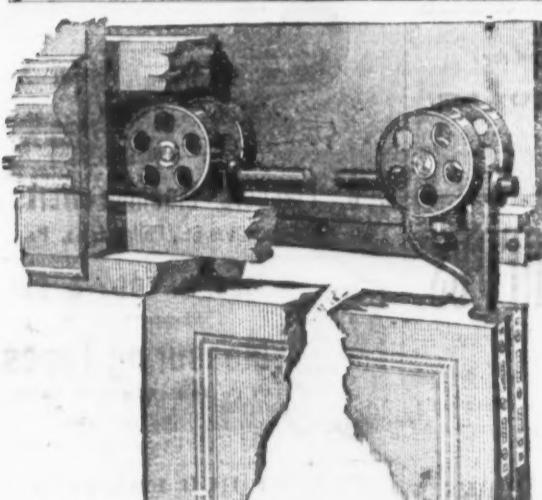
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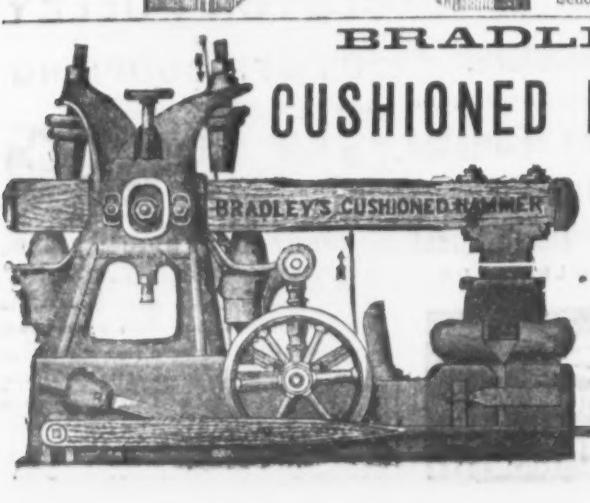
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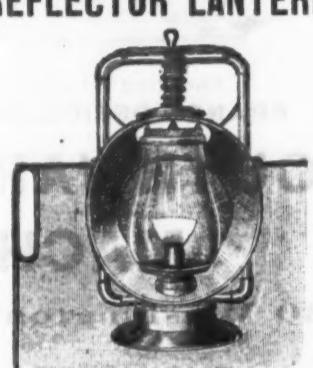
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